AUDIO FILTERS
The curve illustrated shows a group of filters affording sixteen separate bands in the audio and supersonic region with 35 DB attenuation at the cross-over points. These have also been supplied spaced further apart (40 DB cross-over), with intermediate bands, permitting flat top band pass action for any selected range from 100 cycles to 200 KC.

TOROID DUST HIGH Q COILS
UTC type HQ coils have found wide application because of their high Q, stable inductance and dependability. The HQA and HQB types are catalogued. New types HQC and HQD are now available, effecting a Q of over 200 at 50 KC and 100 KC respectively.

SATURABLE REACTORS
Saturable reactors are used extensively for both power control and phase control. The left curve is that of a small (1" cube) sensitive unit indicating the variation of inductance with saturating DC. The right curve is that of a moderate size power control reactor indicating power to the load with saturating DC.

CURRENT LIMITING TRANSFORMERS
This type of transformer is used extensively to extend the life of vacuum tubes by limiting the filament current when cold. The curve at the left is that of a typical transformer of this type for high power amplifier tubes in broadcast service. The curve on the right illustrates limiting action in a high voltage transformer for seclor service.

May we design a unit for your application problem.
FOR DEPENDABILITY you can’t beat these two fine G-E "old-timers". They’re doing a sterling job, day-in and day-out, in thousands on thousands of rigs.

Always—from the first post-spark years—the GL-203-A and GL-211 have been popular ... and remain so today. They’ve been continuously improved and refined, of course, since it’s G-E policy not only to originate, but to stay ahead in tube design and performance!

Versatility is a hallmark of these triodes. They are used widely as Class B a-f modulators, as Class C r-f amplifiers; also, the GL-211 (with a lower amplification factor, its only difference from the GL-203-A) finds frequent application in Class A a-f service.

Get the full story about these proved, popular ham types TODAY from your nearby G-E distributor! Electronics Department, General Electric Company, Schenectady 5, New York.

AS USERS KNOW . . . Two tubes of either type in Class B a-f service have an output of 260 w (at 1,250 v), which will voice-modulate a 1-kw final. Also, as noted elsewhere, the GL-211, due to its lower mu (12 against 25), serves exceptionally well in Class A a-f work.

ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR

GENERAL ELECTRIC
The "Boomerang" (MB-3)

The new "BOOMERANG" is a break-in device, a signal monitor, a code practice unit, and a tone modulator for MCW. It will follow the fastest bug. Self-contained power supply. All you need is a receiver with a headphone jack. Improves your QSOs 100%.

The HF 10-20 Converter

It provides outstanding and imageless reception on 10, 11, 13 and 20 meters. Output (i.f. frequency) is 7 mc. Features include provision for separate antenna, band selector switch, self-contained power supply, planetary tuning and high gain. If your receiver tunes only to 18 mc, the HF 10-20 is necessary for reception on 10, 11 and 15 meters, and will provide improved reception on 20 meters.

From two meters to reception through the broadcast band, RME receiving equipment still provides the optimum in performance.

The new DB-22 Preselector, with self-contained power supply, has an overall gain of 30 db throughout its tuning range of .54 to 44 mc. The image ratio is 50 db down with a communications receiver such as the RME-45.

The RME-45 is a piece of equipment that stays modern. It's now available with the new NBF-4 ratio detector for narrow band FM. The NBF-4 can also be used with all previous models of RME-45s.

The VHF-152 Converter was quick to set many new DX records on 144 to 148 mc. Performance is also outstanding on 6 and 10 and 11 meters. It has generous bandspread, high gain, imageless reception and self-contained power supply.

Illustrated folders on request.

Canadian Representative:
Measurement Engineering, Ltd.
Annapolis, Massachusetts.

Illustrated folders on request.
CONTENTS

"It Seems to Us ... " ........................................ 11
What Is Single-Sideband Telephony?  
Byron Goodman, W1DX 13

Single-Sideband Operating Tests  
O. G. Villard, jr., W6QYT 16

A Single-Sideband Transmitter for Amateur Operation  
Arthur H. Nichols, W0TQK 19

Any DX Today? ....  D. W. Heightman, G6DH 25

An Easily-Adjusted VFO ....  Harry G. Burnett, W1LZ 32

Hamfest Calendar ............................... 37

ARRL Week and Member Party — Jan. 24th–25th  
F. E. Handy, W1BDI 38

In QST 25 Years Ago This Month  
F. E. Handy, W1BDI 39

Technical Topics —  
The Lazy Man’s Q5-er .......................... 40

Happenings of the Month .......................... 42

Parallel Standing Waves ... John W. Paddon, VE3BLZ 45

14th ARRL International DX Competition  
F. E. Handy, W1BDI 50

Silent Keys ............................... 52

United States Naval Reserve ........................ 53

New England Amateurs Aid in Forest-Fire Emergency .... 54

'Phone-Band Phunnies ....  John T. Frye, W9EGV 56

The World Above 50 Mc. .......................... 57

A Bantam 1-Watter ............................ 62

Hints and Kinks ............................ 63

How’s DX? ............................ 64

First V.H.F. Sweepstakes ....  F. E. Handy, W1BDI 68

L.A.R.U. News ............................ 70

Correspondence from Members .......................... 71

Operating News ............................ 72

Station Activities ............................ 80

New Books ............................ 122

WWV Schedules ............................ 124
"The hottest ham performance ever at this price . . ." That's the verdict of amateurs who have had a chance to try Hallicrafters new Model SX-43.

This new member of the Hallicrafters line offers continuous coverage from 540 kilocycles to 55 megacycles and has an additional band from 88 to 108 megacycles. AM reception is provided on all bands, except band 6, CW on the four lower bands and FM on frequencies above 44 megacycles. In the band of 44 to 55 Mc., wide band FM or narrow band AM just right for narrow band FM reception is provided.

One stage of high gain tuned RF and a type 7F8 dual triode converter assure an exceptionally good signal-to-noise ratio. Image ratio on the AM channel on band 5 (44 to 55 Mc.) is excellent as the receiver is used as a double superheterodyne. The new Hallicrafters dual IF transformers provide a 455 kilocycle IF channel for operating frequencies below 44 megacycles and a 10.7 megacycle IF channel for the VHF bands. Two IF stages are used on the four lower bands and a third stage is added above 44 megacycles. Switching of IF frequencies is automatic. The separate electrical bandspread dial is calibrated for the amateur 3.5, 7, 14, and 28 megacycle bands.

Every important feature for excellent communications receiver performance is included in the SX-43.
AU ESSENTIAL AMATEUR FREQUENCIES
FROM 540 kc TO 108 MC
AM - FM - CW RECEPTION
IN BAND OF 44 TO 55 MC; WIDE BAND FM
OR NARROW BAND AM ... JUST RIGHT FOR
NARROW BAND FM RECEPTION
CRYSTAL FILTER AND EXPANDING IF CHAN-
NEL PROVIDE 4 VARIATIONS OF SELECTIV-
ITY ON LOWER BANDS
TEMPERATURE COMPENSATION FOR FREE-
DOM FROM DRIFT

SERIES TYPE NOISE LIMITER
PERMEABILITY ADJUSTED "MICROSET" IN-
DUCTANCES IN THE RF CIRCUITS
SEPARATE RF AND AF GAIN CONTROLS
EXCEPTIONALLY GOOD SIGNAL-TO-NOISE
RATIO
SEPARATE ELECTRICAL BANDSPREAD CALI-
BRATED FOR THE AMATEUR 3.5, 7, 14, AND
28 Mc BANDS

hallicrafters RADIO
THE HALLCRAFTERS CO., MANUFACTURERS OF RADIO
AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.
Sole Hallicrafters Representatives in Canada:
Rogers Majestic Limited, Toronto-Montreal
| Section Communications Managers of the ARRL Communications Department |
|-----------------------------|-----------------------------|
| **Reports Invited.** All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio Club reports are also desired by SCMs for inclusion in QST. **All ARRL Field Organization appointments are now available to League members. These include ORS, OES, and OBS. Also, where vacancies exist, SCMs desire nominations for SEC, EC, RM, and PAM. In addition to station and leadership appointments for Members, all amateurs are invited to join the ARRL Emergency Corps (ask for Form 7).** |

<table>
<thead>
<tr>
<th><strong>ATLANTIC DIVISION.</strong></th>
<th><strong>CENTRAL DIVISION.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Pennsylvania</td>
<td>Tennessee</td>
</tr>
<tr>
<td>Maryland-Delaware-D.C.</td>
<td>State</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>New Hampshire</td>
</tr>
<tr>
<td>New York</td>
<td>Vermont</td>
</tr>
<tr>
<td>New England</td>
<td>Washington*</td>
</tr>
<tr>
<td>New Jersey</td>
<td>Maine</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DAKOTA DIVISION.</strong></th>
<th><strong>DELTA DIVISION.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>North Dakota</td>
<td>Arkansas</td>
</tr>
<tr>
<td>South Dakota</td>
<td>Louisiana</td>
</tr>
<tr>
<td>Minnesota</td>
<td>Missouri</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>GREAT LAKES DIVISION.</strong></th>
<th><strong>HUDSON DIVISION.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Michigan</td>
<td>Western New York</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Iowa</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MIDWEST DIVISION.</strong></th>
<th><strong>NORTHWESTERN DIVISION.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>North Dakota</td>
</tr>
<tr>
<td>Indiana</td>
<td>South Dakota</td>
</tr>
<tr>
<td>Kansas</td>
<td>Minnesota</td>
</tr>
<tr>
<td>Michigan</td>
<td>Missouri</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PACIFIC DIVISION.</strong></th>
<th><strong>ROCKY MOUNTAIN DIVISION.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska</td>
<td>Colorado</td>
</tr>
<tr>
<td>Idaho</td>
<td>Utah-Wyoming</td>
</tr>
<tr>
<td>Montana</td>
<td>Arizona</td>
</tr>
<tr>
<td>Nevada</td>
<td>New Mexico</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SOUTHEASTERN DIVISION.</strong></th>
<th><strong>SOUTHWESTERN DIVISION.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td>Arizona</td>
</tr>
<tr>
<td>Georgia</td>
<td>New Mexico</td>
</tr>
<tr>
<td>Louisiana</td>
<td>Nevada</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>WEST GULF DIVISION.</strong></th>
<th><strong>MARITIME DIVISION.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>California</td>
</tr>
<tr>
<td>Louisiana</td>
<td>Oregon</td>
</tr>
<tr>
<td>North Texas</td>
<td>Washington*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>WORLD DIVISIONS.</strong></th>
<th><strong>OFFICIALS.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic</td>
<td>Officers acting</td>
</tr>
<tr>
<td>Pacific</td>
<td>temporarily</td>
</tr>
<tr>
<td>SOUTHERN</td>
<td>in the absence</td>
</tr>
<tr>
<td>Locations.</td>
<td>of a regular</td>
</tr>
<tr>
<td></td>
<td>officer.</td>
</tr>
</tbody>
</table>
JENSEN Speech Master Reproducers have long been widely used in moderate-level intercom, paging and P.A. systems. Now, in **Alnico 5** design, they are once more available for all applications where clear, crisp, intelligible speech and good “talk-back” performance are required. Ideal for amateur, commercial, police and aviation phone communication as separate units or integral equipment. In amateur CW they aid selectivity, help signals override QRM and QRN. The husky voice coil withstands keying transients.

**JENSEN MANUFACTURING CO.**
6625 S. LARAMIE AVE., CHICAGO 38, ILL.
In Canada: Copper Wire Products, Ltd.
11 King Street W., Toronto 1

---

**MODEL AP-10 SPEECH MASTER**
(Desk Type)

- **AP-10 (ST-590)** with 3-4 ohm voice coil...$13.90
- **AP-10 (ST-591)** with 45-50 ohm voice coil...14.50

---

**MODEL AP-11 SPEECH MASTER**
(Panell Type)

- **AP-11 (ST-592)** with 3-4 ohm voice coil...$11.30
- **AP-11 (ST-593)** with 45-50 ohm voice coil...11.90

---

**MODEL AR-10 REFLEX SPEECH MASTER REPRODUCER**
Specially designed reflex horn increases efficiency in mid-range, giving added effectiveness and punch to speech quality when used for paging, intercom and call systems operated at moderate levels. Reflex construction prevents direct access of snow or rain to speaker diaphragm. Power rating: 6 watts. Space within case provided for mounting 1/2 x 1 3/4" transformer. Over-all diameter: 10", depth: 8". Complete with bracket for wall or post mounting.

- **AR-10 (ST-643)** with 3-4 ohm voice coil...$20.00
- **AR-10 (ST-644)** with 45-50 ohm voice coil...20.75

**Designers and Manufacturers of Fine Acoustic Equipment**
Crystal quality goes much deeper than the frequency on the nameplate. Here at Bliley we practice and preach quality control all the way from the raw quartz.

Extra care is taken to insure accuracy of calibration. Frequency stability is maintained by precise orientation of the quartz plate. Every crystal must meet a high standard of activity before acceptance. All crystals are plated to insure long term dependability and trouble-free service.

By any comparison Bliley crystals are a "techniquality" product. For further details get a copy of Bulletin 35 from your distributor.

**2 Bliley Type AX2 Crystals Will Fit Any Octal Socket**

**Build Your Transmitter Around A Bliley CCO-2A**

A completely packaged crystal controlled oscillator for the 2-6-10-11 meter bands. An ideal nucleus for new construction or conversion of existing equipment. See Bulletin 34.
Because they fill a real need for conserving filament power, Hytron instant-heating tubes are in. Yes, the 2E25, 2E30, HY69, HY1269, and 5516 are in the new mobile transmitter designs of many famous friends—too many to thank in this small space. The 2E25 and 2E30 also appear on the Army-Navy Preferred List. Why so popular? With no standby current, battery drain can be cut to 4% of that with cathode types—attainable power output and range increase. Potentials of rugged filaments are centered for battery operation. Beam pentode versatility simplifies the spares problem—one type can power all stages. Join the leaders. If you build mobile equipment—for land, sea, air—put Hytron original instant-heating, easy-on-the-battery tubes on your preferred list.
THE AMERICAN RADIO RELAY LEAGUE, INC.,
is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs. Inquiries regarding membership are solicited.

All general correspondence should be addressed to the Secretary at the administrative headquarters at West Hartford, Connecticut.
"It Seems to Us…"

SINGLE-SIDEBAND

Several articles in this issue of our magazine point the way toward the most significant development that has ever occurred in amateur radiotelephony: carrierless single-sideband emission. After years of fearing that our receivers weren’t stable enough to permit the use of s.s.s.c.—as we’re calling it—the adventitious appearance on the air of an experimental station with this method of emission has shown that it isn’t so difficult after all and that its merits are waiting for all of us. And so immense are these advantages that we are convinced that a speedy revolution in our equipment and our operating practices is imminent and certain.

When only a single sideband is radiated it is found to be fairly easy to reinsert the carrier at the receiver—even the ordinary b.f.o. works quite well. The communication bandwidth required is only about half of that necessary for the usual emission. Of vastly more importance is the fact that if we were all single-sideband, the reinserted carrier (except in the rare case where two signals were on the same frequency) would be properly related only to the desired signal, and all other near-by signals would remain a sort of nonspeech rumpus which the brain can rather readily ignore or reject. We are thus offered the possibility of maintaining better communication with ‘phone stations moved closer together than we have ever thought possible—even closer than the channel-width. The increase in the effective width of the ‘phone assignments, instead of being merely doubled, may prove to be several times that great. But even two ain’t hay.

In the usual present-day snarl of ‘phone interference, not only are we bothered by the fact that the conflicting signals are understandable as speech but we have the piercing shrieks of heterodynes. They come from the simple fact that in the usual method the carriers contain two-thirds of the power. Even if single-sideband did not practically confine recognizability to the desired signal, the utter absence of heterodyne beats would greatly simplify our communication problem. The signals would all be just “voices” and could be read at will just by “listening” to the right one. There is an experience everybody has had that will serve as an example. You are, let us say, in a theater lobby at intermission, with everybody out for a smoke, or you’re at a noisy cocktail party. Standing closely packed, everybody is talking at once but, by simply concentrating and using your “brain filter,” you can listen-in on any one of a large number of near-by speakers. They are using carrierless single-sideband. To make a comparison with present-day radiotelephony you must now imagine each of these persons wearing around his neck a flask of compressed air equipped with a peanut whistle, all going at once and in all sorts of notes, most of them louder than any human voice. What chance would you then have of understanding each near-by speaker at will? About as much as you do on the ‘phone bands today!

S.s.s.c. will have many other virtues in its catalogue. Except for the final amplifier and perhaps its driver, all the gear can be at receiving-tube level, saving the great expense of Class B modulators and their big transformers and power supplies—and the space they now occupy. The final, no longer two-thirds preoccupied with amplifying the carrier, can have its power capabilities much more effectively used. Of equal interest is what will happen to receivers. There will no longer be any excuse for the manufacturers not building into them the considerable increase in selectivity that they could put there now but don’t, and there will be a definite impetus to build receivers that possess excellent stability. While s.s.s.c. can be received on our ordinary receivers, a selectivity curve designed to accept only one speech sideband—something that we will need for best results to chop off the chatter from undesired signals—will make a much more useful tool than we get today with a curve intended to straddle both sidebands, and music sidebands at that. Communication could be so very different!

It’s interesting to think what s.s.s.c. can do for our operating practices, too. In addition to the reduction of interference and the
ability to accommodate a great many more stations, a major advantage is that duplex operating immediately becomes possible. The present wise prohibition of duplexing comes from the fact that we can't stand the interference of unmodulated carriers, but the prohibition simply disappears when there is no carrier at all. Amateur telephony could have the ease of landline telephony. But we'll probably have to revise our present ideas about the desirability of all parties to a QSO being on the same frequency, and admit that some separation is desirable for s.s.s.c. duplex. We'll have to standardize, too, on which sideband we'll radiate, so that the reinserted carrier at the receiver won't have to be flopped from one side to the other in different cases. Our regulations, incidentally, may require some revision, since our present 'phone assignments are to A3 emission and A3 is defined in terms of a modulated carrier. That, it may safely be assumed, is a mere technicality, since A3 is commonly held simply to mean a.m. as against f.m., and since there is never objection to new methods that economize in spectrum space.

There are several amateur s.s.s.c. stations on the air now and more are coming along rapidly. You can listen for yourself. Brother, won't it be something when we are all carrierless and with only one set of speech frequencies? Everything points to s.s.s.c. becoming the accepted amateur method in the near future. Condition yourself to the thought, and we'll supply practical information as rapidly as possible.

ARE YOU KIDDING?

If you fancy yourself an amateur psychologist — and who doesn't? — you can have yourself some fun by putting an ARRL Operating Aid No. 3 in front of you on the operating table. (For the uninitiated, the ARRL OpAid No. 3 is simply a small card with the RST system printed on it, available to one and all upon request.)

The psychology part comes in when you start to use the thing. Let's assume you call and raise a fellow with an average signal and a slight trace of ripple on his signal. When he comes back to you, he gives you “RST 579” and a half minute or so to think over your report to him. If you didn't have OpAid No. 3 in front of you, your report to him would be “RST 579” with no hesitation. But a quick glance at the card shows that, by the definitions, your report to him should be “RST 568,” which means “Perfectly readable, good signals, good d.c. note with just a trace of ripple.”

(If there is any QRM at all in the background, the R report should be 4, meaning “Readable with practically no difficulty.”) His probable mental reaction will be, “That tin-eared so-and-so, why doesn't he get a good receiver? And what's wrong with my note — everyone gives me T9!” Over the air, he may venture an inquiry about how “rough” his signal is, as a result of the T8 report. You can then go on to explain that you have a copy of the RST system in front of you, and that the T8 report doesn’t indicate he will be deluged by FCC tickets. He'll probably sign with you in a hurry, wondering what kind of misguided lid you are.

You know this isn't overdrawn at all. Give a fellow a report of S4 these days and he will wonder how you can possibly hear him at all. Give anyone T8 and he starts to tear the rig apart. And yet the RST system is only a shorthand device for getting information across to the other fellow in a hurry. A language where everyone has different definitions for the same words would be a pretty useless thing, and the general disregard for the accurate use of the RST system makes it seem silly to use it at all.

We have to do it right or there's no sense in it. The fellow in some distant land who has no monitoring equipment depends upon the reports he gets for technical information — if you tell him he's T9 when he's T6, and T7 when he's T3, you haven’t much right to squawk about “the bum signals that clutter up the band.”

But forgetting the sermon, if you want some fun with psychology — both yours and the other fellow's — get an OpAid No. 3 and hang it on the front of your receiver. You'll be amazed!

—B. G.
What Is Single-Sideband Telephony?

A Few Facts About the New 'Phone Technique

BY BYRON GOODMAN,* W1DX

The history-making single-sideband suppressed-carrier transmissions of W6YX and W0TQK have aroused considerable interest in the transmission and reception of these signals, and well they might, since it is not at all unlikely that most of us will be using the system within a few years. The name describes the thing of course, but it doesn't spell all. Neither does this article, but it should give you a start toward understanding the stuff.

Everyone knows that a regular a.m. 'phone signal takes up space frequency-wise that can be represented by the sketch in Fig. 1. The carrier frequency, designated by \( f \), is a single frequency. The "sidebands" take up room on either side of this frequency, depending upon the audio frequencies present in the modulation. The crosshatched areas in Fig. 1 represent the frequencies occupied by the sidebands.

At the receiver, the usual practice is to center the carrier in the passband of the receiver, and to use a receiver with a response curve capable of passing both sidebands. This is shown in Fig. 2, where the sketch of Fig. 1 has been superimposed on a typical selectivity curve of a receiver. However, it is not at all necessary to receive both sidebands, and this fact has been used by McLaughlin ¹ to reduce heterodyne interference. A response curve of a receiver capable of receiving only one sideband is shown in Fig. 2 as a dotted line. Under such conditions, nothing is omitted from the original signal, since one sideband is all that is required. As W1DBM aptly puts it, "both sidebands are saying the same thing."²

However, while one sideband can be eliminated without impairing the quality one iota, the carrier cannot be eliminated, or even reduced appreciably, if the modulation percentage is high. If, for example, the single-sideband receiver curve of Fig. 2 (the dotted line) were such that it cut into the carrier, the carrier would be reduced in the receiver. This in turn would give a signal that, so far as the detector was concerned, would look like an overmodulated signal, since the proper carrier-to-sideband proportions would not have been preserved. On the other hand, the sideband (or sidebands) can be reduced, leaving the carrier the same, with no ill effects other than to reduce the effective modulation percentage that the detector sees. This is the principle of "exalted-carrier" reception.³

The point that the carrier must be present in

---


---

* Assistant Technical Editor, QST.

January 1948
on the signal before audio detection takes place. Methods have been known for years for "suppressing" the carrier, and their effectiveness has been proven by a good record of commercial use. The two common types of modulators that suppress the carrier during modulation are the "balanced" modulator (using tubes) and the "ring" modulator (using diode rectifiers in a bridge or lattice arrangement). Both of these take the modulation frequencies and the carrier frequency and give an output that consists only of the sidebands (along with a few combinations of carrier harmonics that have to be filtered out). Of course the carrier suppression isn't perfect, but suppressions on the order of 40 to 60 db. are not difficult to obtain, and careful balancing has brought the figure up to 100 db.

But neither Johnny Q. Ham nor anyone else is going to get very far with a system that only suppresses the carrier. While it is easy to transmit, it is practically impossible to receive. The mathematics of the thing shows that the carrier has to be reinserted with the same phase relation to the sidebands that the original carrier had. This means, therefore, that it would have to have exactly the same frequency and phase relationship as the original carrier, and no frequency drift could be tolerated, since any at all would cause a phase change. So that's out the window.

However, the same mathematics shows that if one sideband is received, the carrier can be reinserted in any phase, and in practice the frequency can be off by 10 or 20 cycles without impairing the quality too much. That's more like it. While 10 or 20 cycles seems like a happy state of perfection for a receiver, it isn't outside the realm of possibility at all and, in fact, receiver stability has been sneaking up on us over the years without our realizing it. But more of that later.

**Sideband Suppression**

There are two classical methods of eliminating one sideband. One is a brute-force method that

**Fig. 3** — The filter required for sideband elimination requires very rapid attenuation in a range of about 1000 cycles. The characteristic shown above would be suitable for such work — the normal carrier frequency would be placed at f.

consists simply of lopping off one sideband by using a very selective filter. This is the method used by the commercials. Another more delicate and subtle system requires an elaborate arrangement incorporating 90-degree phase shifts of carrier and audio signals. It has been used, but it isn't easy.

You can't just dismiss that filter with a sentence or two. In the first place, it has to have a characteristic similar to that shown in Fig. 3, and filters like that aren't easy to come by. The frequency f represents the carrier frequency at which the filter is used, and the important thing about the filter is the slope of the curve between "+0.5 kc." and "-0.5 kc." Notice that within this 1-kc. range the attenuation goes from 0 to about 50 db. The slope on the other side of the filter is unimportant, just so long as it permits the sideband to pass without excess attenuation. Filters with a characteristic like that of Fig. 3 are not easy to obtain, and the filter is usually designed for a low frequency, since the selectivity in cycles decreases as the frequency f is increased. The filter characteristic shown in the McLaughlin article would be satisfactory, and this was obtained at 50 kc. Fifty or 75 kc. probably represents the upper frequency limit for effective sideband filters, unless one resorts to crystal lattice-type filters, infinite-rejection circuits and other complex dodges.

**Frequency Changing**

Our s.s.s.c. transmitter now begins to take shape. It will start off with a modulator that suppresses the carrier, and then we'll go through a filter that will lop off one sideband, after which we'll have to get the signal to the operating frequency and out on the air. Fig. 4 shows the signal as far as we've gone.

As mentioned earlier, this filtering of the sideband would be done at some low frequency, and we have the problem of getting to the operating frequency. We can't do it by frequency multiplication, any more than we can in conventional a.m. after modulation. So the next big point we run across is that you heterodyne the signal when you change frequency in s.s.s.c. work. This is old

**Fig. 4** — The basic system for obtaining an s.s.s.c. signal. The carrier and audio frequencies are fed into a balanced modulator, where the sidebands are generated minus the carrier. The signal is then passed through a filter that removes one sideband.
stuff, of course — we do it all the time in receivers and converters. So, if our output from the sideband filter is 50 kc, and we are headed for 14,250 kc, we would feed the single sideband into a mixer with an oscillator running at, say, 600 kc. This would give beats of 550 and 650 kc. To use only one, we would run the output of the mixer through a 550-ke filter (a stage of i.f. amplification). Then to get to 14,250, we would beat this signal against a 13,700-ke oscillator and run the output through enough selective stages to wipe out the undesired 13,150-ke signal. All this is shown in Fig. 5. To make the job of the filters a little easier, balanced modulators can be used for the mixers, so that the local-oscillator signal is eliminated in the output. In Fig. 5, the local-oscillator signal is shown in the output of each mixer, as would be the case in conventional mixer circuits.

It is also apparent from Fig. 5 that it is only necessary to change the frequency of the last local oscillator in order to change the output frequency. Thus a basic s.s.s.c. exciter and modulator would consist of the stages shown in Figs. 4 and 5. The frequencies wouldn’t be the same, necessarily, but the principles involved would be. The entire unit would use receiving tubes and, for the most part, receiver components.

**Amplification**

It has been pointed out that frequency changing involves the use of heterodyning instead of multiplication in s.s.s.c. technique. We also have to forget about our cherished Class C amplifiers, because the s.s.s.c. must be amplified in a Class A or Class B stage; i.e., an amplifier that reproduces the input signal without distortion. But our receiver techniques are generally Class A, and Class B amplifiers are no strangers to the ‘phone man who has been using one for a modulator for the past 14 years. We don’t even have to worry about too-careful adjustment of these Class B amplifiers. They are more tolerant with no carrier, unlike the critical ‘linear’ amplifiers everyone shies away from. And, unlike audio Class B amplifiers, they don’t have to be push-pull.

So there you have the fundamentals at the transmitter end: carrier suppression in a balanced modulator, sideband rejection in a sharp filter, frequency changing by heterodyning, and amplification in Class A or Class B amplifiers.

**Reception**

The receiver end is a lead-pipe cinch. All you have to do is tune in the signal and put back the carrier in the right place! Fortunately, any communications receiver is set up to do this, although the technique seems a little strange at first. The first thing you do is turn off the a.v.c., although you can leave it on while you tune in the side-band if you want. You tune in the sideband, as indicated by maximum strength in the ‘speaker (or maximum swing of the S-meter, if the a.v.c. is on). With a.v.c. off, switch on the b.f.o. and adjust its control, not the main tuning control, until the signal clears up and begins to sound like something human. As you vary the b.f.o., you will get various types of inverted speech and deep and falsetto voices, but when you hit it right the speech will sound as natural as any other signal. It may be necessary to back off the manual gain quite a bit, particularly if you have a weak b.f.o. in the receiver. In any event, it’s a good idea to run with reduced i.f. gain, because you have no a.v.c. to hold the gain down in the receiver, and you can’t afford to have any stage in the receiver overloaded, since the linearity will be destroyed.

**The Advantages of S.S.S.C.**

What does all this get you? Some of the benefits won’t show up until a number of stations are using the system, but here are a few of the obvious advantages: Transmitting only one sideband, the receiver bandwidth has to be only half as great, for the same fidelity, as it does for double-sideband reception. This gives an immediate 3-db. improvement in signal-to-noise, since reducing the bandwidth by a factor of 2 decreases the noise by the same amount. The power required at the transmitter end for equivalent double- and single-sideband signals at the receiver is considerably less in the case of s.s.s.c. transmission. There is no carrier power to be supplied, and all of the power goes into the one signal-generating sideband. For example, a kilowatt ‘phone using double sidebands and the usual carrier requires that a kilowatt of power be supplied to the r.f. amplifier plus the power consumed by the 500-watt modulator. The same signal is obtained at the receiver in the s.s.s.c. system by furnishing power to the final amplifier equal to what would be drawn by a Class B modulator capable of delivering 250 watts of audio. The saving in transmitter input is plenty! When you aren’t talking you have no output signal, so there is no good reason why you can’t carry on excellent duplex work right on your own frequency! With (Continued on page 189)
Single-Sideband Operating Tests

Some Results — and Suggestions for Improving Reception

BY O. G. VILLARD, JR.* W6QTT

The following notes are based on our own listening experience, plus reports received in over-the-air contacts. There is little that is quantitative in all this, but to the extent that the impressions of careful observers may be relied on, it should be of interest.

Relative Power

For equivalent sideband power, single-sideband-suppressed-carrier apparently gives a louder-sounding signal than conventional double-sideband transmission. One would suspect this to be in part attributable to the increase in receiver sensitivity when the b.f.o. is switched on (caused by curvature of the second-detector characteristic—a well-known effect) but the significant thing is the fact that the "louder-sounding" signal gets through the QRM better. One possible explanation is that in many communications receivers sideband clipping begins at audio frequencies as low as 2000 cycles per second. Thus a conventional signal of average width would be somewhat clipped whereas the s.s.s.c. signal might not be clipped at all.

The double-sideband transmitter at W6YX has a 7000-cycle total radiated bandwidth, whereas the s.s.s.c. transmitter has a 2500-cycle total radiated bandwidth. Both rigs use sharp cut-off low-pass filters. The matter of bandwidth is one point which obscures the comparison at W6YX, of course, since the audio-frequency response of the s.s.s.c. rig is 300-2500 cycles whereas that of the double-sideband rig is 100-3500 cycles. Thus the speech sounds "crisper" on the s.s.s.c. rig.

We hope to arrange matters so that both rigs have the same speech bandwidth, and will make further tests.

However, taking everything into account, the results with s.s.s.c. still are surprisingly good. Once the knack of tuning the signal in is learned, most amateurs prefer the single- to the double-sideband transmission.

Tricks in Demodulating the Signal

Roughly one-fourth of the operators with whom we tried out s.s.s.c. reported themselves unable to receive it clearly at all. The most common complaint was that no matter how the local oscillator was tuned, the signal never did become clear and distortion-free. It is believed that a certain percentage of receivers have local or beat oscillators which have appreciable frequency or amplitude modulation because of hum voltages. On such a receiver a c.w. signal simply doesn't sound p.d.c. This effect is often missed in practice, because a small amount of hum may go unnoticed in c.w. work. But any hum modulation on the reinserted carrier of an s.s.s.c. signal plays absolute hob with the speech quality. We have one receiver on the campus which has this defect, and s.s.s.c. heard on it sounds appalling. The hum completely garbles the voice, apparently because each individual speech-frequency component acquires the hum modulation.

It is very desirable to use the minimum r.f. gain setting when the b.f.o. is used for demodulation. This assures a strong reinserted carrier in relation to the signal. The a.v.c. should also be disabled, because in many receivers a change in a.v.c. voltage, such as might be caused by a burst of incoming speech, can shift the receiver local oscillator a few cycles, thus detuning the reinserted carrier from the correct frequency at a syllable rate.

* Trustee, W6YX; Department of Electrical Engineering, Stanford University, Calif.
The most desirable arrangement is to use a separate signal-frequency oscillator. This allows the receiver to be tuned without upsetting the frequency of the reinserted carrier. It is then easy to adjust the receiver to accept the band occupied by the signal, with the aid of a variable-selectivity crystal filter. Maximizing the audio output, by varying the tuning alone, assures correct setting of the receiver passband. Selectivity may then be increased until sideband clipping is evident. Some of the oscillators that have been successfully used to demodulate the s.s.s.c. signal include the BC-221- or LMS-type frequency meter, several varieties of VFO, and even a regenerative preselector set into weak oscillation! The harmonics of a separate oscillator can of course be used.

The strength of the locally-injected carrier is not especially critical. Too little voltage causes the speech to sound distorted. Too much causes the receiver to block up or become microphonic. However, the receiver a.v.c. may be switched on when a separate oscillator is used, and this will prevent blocking although the available gain may thereby be reduced. For greatest flexibility, the oscillator injection should probably be adjustable. Incidentally, some receivers, particularly the HQ-120, seem not to have very much b.f.o. voltage injected into the i.f. amplifier. Greater coupling here might help.

Stability Considerations

Virtually all receivers will drift while warming up after being thrown from “stand-by” to “on.” It is therefore desirable to leave the receiver on during transmission and reception, if the b.f.o. is used for demodulation. A continuously-operating separate oscillator renders this procedure unnecessary. Moreover, receivers without voltage regulation of the local oscillator will shift frequency enough, when the line voltage changes by a minute amount, to throw the reinserted carrier off frequency when the b.f.o. is used for demodulation. One amateur had to return every time his wife switched a light on and off upstairs! Sets like the AR-88 and the new HRO do have voltage regulation of the local oscillator, and are noticeably more stable with respect to line-voltage changes.

We have found that unless the receiver or the external oscillator is phenomenally stable, it will be necessary to return from time to time to keep the reinserted carrier on the “nose” anyway. (The Collins 75A receiver seems to get away from this problem very nicely.) Even with an ECO — unless it is voltage-regulated and very, very stable — there will be appreciable drift, requiring occasional retuning. However, tests with two crystals of the same frequency — one in a variable air-gap holder — have shown that it is possible to maintain absolute zero beat even on 10 meters with 80-meter crystals, for considerable periods of time. Exact zero beat may be found by varying the capacitance across the crystal holder for a vernier effect — most variable gaps give too coarse an adjustment. A set-up like this is reminiscent of a loran receiver, in which the pips remain at the same place on the screen for minutes at a time. Thus if two hams wanted to work regular skeds, they could use two crystals on the same frequency — one at the transmitter, and a variable one for carrier reinsertion at the receiver.

Suppression of Carrier

At first it was thought that radiation of a pilot carrier would be desirable. However, unless you are going to pick up this carrier, amplify and reinsert it, it does more harm than good, because if a b.f.o. or separate oscillator is used for carrier reinsertion, it will be found that a strong beat is set up between the pilot carrier and this oscillator when the reinserted carrier is not quite at the correct frequency, but yet not far enough off to affect the intelligibility seriously were the pilot carrier absent. By far the best results are obtained when the “pilot carrier” is completely suppressed.

Using Receiver B.F.O.

It seems to be true that when the receiver b.f.o. is used for carrier reinsertion, using extra crystal selectivity complicates the tuning procedure. This, in all likelihood, is because the incoming s.s.s.c. signal often ends up somewhere outside the receiver passband, if the b.f.o. is not set correctly, and is hence chopped off when the bandwidth is narrowed. It is not easy (as is most desirable) to get the signal properly centered in the receiver passband, and then to set the b.f.o. to the correct frequency! The whole process is greatly simplified when a separate oscillator is used. However, our signals have been received successfully by means of the b.f.o. on virtually every type of receiver, including the BC-312-type surplus set.

Appearance on Panadapter

Several amateurs have looked at the s.s.s.c. signals on the Hallicrafters panoramic adapter, and have reported that the s.s.s.c. signals are about ½ as broad as our conventional signal, whereas they should be only about one-third as broad. This is probably attributable to the poor resolution of the panoramic adapter, although on this point we haven’t much experience as we haven’t tried an adapter ourselves. At any rate the panoramic adapter owners unanimously conceded that the s.s.s.c. was somewhat narrower!

Performance with DX

We have had only three real DX contacts, not having tried for these especially, but the performance on these was what one would expect. In all cases they got us O.K. Actually, the 20-
Some Misleading Impressions

Some amateurs, on hearing s.s.s.c. for the first time, will report the signal to be exceptionally “sharp.” There seems to be a tendency to confuse the exactness with which the local carrier must be reinserted, with the “sharpness” of the signal. Some report, for example, that the signal is “broad” with the b.f.o. turned off, but “extremely sharp” with the b.f.o. on. Fig. 1 may explain this effect to some extent. Without the b.f.o., the receiver output will be the envelope of the s.s.s.c. signal, reduced in strength because of the detuning, and with the relative amplitude of its frequency components somewhat altered. In general, the audio output will be in the range 300-2500 cycles. (Not exactly, of course, as the envelope of an s.s.s.c. signal does not contain the same frequency components as the signal itself. But for a complex wave such as speech, it sounds roughly the same.) Now with the b.f.o. on, and centered, say, at the middle of the passband, the output of the receiver second detector in the example in Fig. 1 will be a band of frequencies in the range 4000-6500 c.p.s. These frequencies will tend to be rejected if the receiver has poor audio fidelity, and in any case the ear is not as sensitive to them. Consequently the receiver output sounds weaker by comparison, and one gains the impression that the selectivity has been increased, as far as the s.s.s.c. signal is concerned, when the b.f.o. is turned on. It should be emphasized that reports on the sharpness — i.e., bandwidth — of the signal are best made with the aid of the crystal filter which, in its sharpest position, effectively turns the receiver into a manually-operated spectrum analyzer.

Miscellaneous Data on S.S.S.C. Tests

The first QSO was with W6VQD, Winfield G. Wagener, September 21, 1947, at 9:30 p.m. PST on 3970 kc. Win reported the signal Q5 SS through heavy 75-meter QRM on his BC-348-Q receiver. He used the crystal filter and reported the quality good and the voice recognizable. The transmitter power was about 20 watts peak into a haywire antenna. W6ZTE is the campus station of the Stanford Radio Club; W6YX, the other transmitter, is located near the Ryan High Voltage Laboratory which is about one mile from the center of the campus. W6ZTE is located in the Electronics Research Building (part of Electrical Engineering Department) on the campus.

The higher-power rig was then built and was first tested over the air in a QSO with WØNWF on 20 meters on October 9, 1947. Peak envelope power output was gradually raised over a period of time to the present 400-watt (approximate) level. This is comparable to the 350 watts of peak sideband power provided by the regular W6YX transmitter running 1-kw, input, assuming an efficiency of 70 per cent. (Average sideband power (Continued on page 122)
A Single-Sideband Transmitter for Amateur Operation

Circuit Details and Tuning Procedure for S.S.S.C. Transmission

BY ARTHUR H. NICHOLS,* W0TQK

Here is a down-to-earth description of the equipment used to generate the 14-Mc. single-sideband suppressed-carrier signal at W0TQK. While a few of the circuits and components may be new to you, you will find that the only real requirement to getting started on amateur s.s.s.c. is rolling up your sleeves and diving into the thing. This rig was built in five evenings, from scratch and with no previous experience, and is a superb example of the really progressive amateur's spirit and ability!

There are five main considerations in the design and construction of a single-sideband suppressed-carrier transmitter. They are (1) as nearly complete suppression as possible of the carrier, (2) elimination of the unwanted sideband, (3) linear operation of the entire transmitter, (4) a minimum of spurious-frequency radiations, and (5) excellent frequency stability.

The first two objectives are obtained by using a balanced modulator and an adequate filter system. Linear operation is obtained by using Class A amplifiers wherever feasible. Spurious frequencies are minimized by using balanced modulators for all frequency conversions, with traps further to reduce the local-oscillator signal that might leak through. The use of crystal-controlled oscillators for the high-frequency signals, running continuously, results in excellent frequency stability. The low-frequency oscillator (9 kc.) is self-controlled, but its power is supplied by a regulated source and, in any event, it takes a large-percentage change to affect the output frequency appreciably.

The block diagram of Fig. 1 shows the various stages required to obtain 14-Mc. output from the original s.s.s.c. at 9 kc. The first modulator, with a carrier frequency of 9 kc., produces the upper and lower sidebands but cancels out the carrier in the output circuit. The first filter passes only the upper sideband. The second and third modulators and filters perform similar functions but on different frequencies.

Circuit Details

If duplex operation is to be used in s.s.s.c. operation, the audio amplifier must have a low noise level, and the microphone must be insensitive to extraneous noise. Any noise or unwanted signal in the audio system will show up as modulation and hence as output, preventing full enjoyment of duplex operation. Further, poor response below 250 cycles in the audio end will make the job

---

The s.s.s.c. exciter at W0TQK was built on four separate chassis. From the bottom up, they contain the power supply, the speech and first modulator, the second modulator, and the third modulator and output amplifier.

January 1948
of the sideband-cutting filter easier. As shown in Fig. 2, a 6SL7 with the two sections in cascade was used in this rig, with a small coupling condenser to reduce the low-frequency response, and the amplifier has plenty of gain for working out of a crystal microphone. The 9-kc. oscillator coil was made by removing the iron from a p.p. plates-to-voice-coil transformer and potting the windings in a small shield can filled with wax. Since transformers vary a great deal, the proper shunt capacitance to tune the circuit to 9 kc. must be found by trial. The 100-µµfd. variable condenser is used to set the oscillator frequency to the right point on the slope of the filter characteristic.

The “ring” modulator used in this first unit uses two 6SN7s connected as diodes. Both the carrier and modulating frequency are canceled out in the output of this arrangement, leaving only the sideband products of modulation and some harmonics. The cancellation is theoretically perfect in an exactly-balanced system, but stock tubes worked satisfactorily in this instance.

Selected 1N34-type crystals might also be used in this application, or the Sylvania V-305 “varistor” unit, which is made up of four selected crystals, could be substituted.

The special balanced output transformer, T202, was wound specially (in the manner of the windings shown in Fig. 5) on a toroidal permalloy core. However, any high-grade transformer core should be satisfactory in this frequency range. In most cases a 1-to-1 turns ratio will be satisfactory.

The sideband filter is the one big headache in the production of single-sideband energy, and it is no small problem. The one used in this equipment was a surplus item and is very difficult to locate. It has a characteristic as shown in Fig. 3. However, with the information given in Terman’s Engineering Handbook and many other texts, an excellent filter can be constructed. When designing one, the steepest possible attenuation slope should be set on the oscillator side, while the other side merely serves to limit the higher-frequency sidebands. A cut-off frequency of about 3 kc. above the oscillator frequency seems desirable. If there is not enough attenuation above this point, the speech amplifier may be designed to furnish additional reduction. In any event, the sideband filter must have high attenuation at all frequencies above twice the oscillator frequency minus the highest audio frequency, to eliminate the lower sideband of the oscillator harmonic and all other higher-frequency signals. The frequency

![Fig. 1 — A block diagram of the WsTQK s.s.c. transmitter. Two frequency conversions are required after the original single sideband is obtained at 9 kc.](image1)

![Fig. 2 — The speech amplifier, first balanced modulator, and sideband filter of the s.s.c. system of WsTQK. Resistors are 1-watt and capacitances in µfd. unless otherwise noted.](image2)

- T201 — Single plate to 200-ohm line, center-tapped (Thordarson 55A15).
- T202 — Balanced line-to-line, special (see text).
- T203 — Push-pull plates to voice coil, with iron core removed.

The 1800-µµfd. shunting capacitor will vary with the winding used, and a capacitance necessary to tune the circuit to 9 kc. should be employed. The 100-µµfd. variable condenser gives a tuning range of about ± 125 cycles.

20 QST for
Fig. 3 — Transmission characteristic of the 9- to 11.6-kc. bandpass filter shown in Fig. 2. The rapid attenuation in the region between 9.5 and 8.5 kc. is the secret of the suppression of the lower sideband.

of this first filter is not at all critical and may be as high as 50 kc., but it must be remembered that we are after a steep slope in cycles and not in per cent. If too low a frequency is used, trouble will be encountered in the second filter when it tries to separate the upper and lower sidebands at that point. Since condensers are cheap and coils are hard to wind, a low design impedance of around 500 ohms makes construction easier. It goes without saying that high-Q coils are extremely desirable.

Second Modulator

The second-modulator-and-filter unit operates on 540 kc. and is the simplest to build since, for the most part, conventional receiver i.f. technique is used. The wiring diagram is shown in Fig. 4. Coils were obtained from junked i.f. transformers, with turns removed to permit them to resonate around 540 kc. It is desirable to have a tuning range in these transformers of a little more than twice the first-oscillator frequency (9 kc.) so that either sideband can be selected. A crystal oscillator was used in this section mainly because one was available in the junk box, but a good self-controlled oscillator, running continuously from a regulated power supply, should serve just as well. Injection voltage from this oscillator to the modulator was set at 2 volts, as was the case in the other two modulators, although this value is not very critical.

The output coil for the modulator gave a great deal of trouble in the original design stages, and the final design was hit upon only after filling the shack with what seemed like miles of No. 32 wire. This turned out to be a bifilar winding for the primary with a single scramble-wound secondary, as shown in Fig. 5, and it gives excellent balance. It is simple to construct, and is also used in the third-modulator grid circuit. Because of variations in construction, the necessary amount of shunting capacitance may have to be found by cut-and-try.

As in the first modulator, the selection of frequency for this section is not critical, but there are several factors to be considered. The frequency must be high enough so that the sidebands generated in the next modulator will be far enough apart to be readily separated by a filter. But the frequency of the oscillator in this second section must be low enough so that its following filter will not have to be too selective. Then, too, the procurement of components is always a
problem, particularly if they must be special, and so a frequency somewhere in the i.f. range of present-day receivers seems indicated. It is also a great help to be able to listen to the output of this stage in a receiver, and so the low-frequency end of the broadcast band seems to be a logical spot.

Third Modulator

The frequency of the third section, and consequently the selection of components, depends entirely on which amateur band is to be used, and the preceding frequencies. Since only 14-Mc. operation was planned in this instance, an oscillator frequency around 13,000 kc. was needed, and a crystal ground for working in the 11-meter band filled the bill nicely. The wiring diagram of the third-modulator section and the following amplifiers is shown in Fig. 6. A 6SL7 in an oscillator-doubler combination gave the required 2-volt signal, and the coils in these stages were shielded to prevent any strays from getting into the output amplifiers and causing out-of-band radiations. The output of the third modulator is low, as in the other modulator stages, but a single 6SG7 operating Class A brought the signal up to about 15 volts, ample to drive an 807 as a second Class A amplifier. Since the over-all gain of these two stages is very high, it is essential to use complete shielding as well as parasitic suppressors in the 807 stage. If the stage driven by the 807 does not operate as a zero-bias Class B stage (and hence load the 807 at all times), it is necessary to use a loading resistor across the 807 tank. In our case the 807 stage was loaded by a 4000-ohm resistor, since the 807 is used to drive a pair of 813s. The peak output power of the 807 stage appears to be about 10 watts, and it is ample to drive the 813s to 1-kilowatt peak input.

Power Supply

There is little to be said about the power supply, since it is conventional in every way. However, the wiring diagram is shown in Fig. 7, since the control circuits are also included in this unit. The control circuit is a d.p.s.t. relay that opens the cathode circuit of the 6SK7 540-kc. amplifier and the plate power to the 807 stage. The oscillators are allowed to run continuously, to minimize frequency drift.

Construction

The entire exciter, including the power supply and control circuits, is mounted on a 30-inch relay rack. In the interest of economy and ease of construction, panels were made of 0.050-inch aluminum (bought in surplus) with the top and bottom edges turned back to strengthen the panel. In spite of the thin material there is ample strength to support the heaviest components, and a great deal of time and labor was saved by working in aluminum instead of steel. All tube sockets are mounted on these panels, which puts all of the tubes on the fronts of the panels, and the wiring becomes a simple matter. Although this type of construction does not conserve space, it is invaluable in testing and development. The author had never seen another single-sideband rig, and so all sorts of serious difficulties were anticipated. Fortunately, they weren't encountered.

The power supply, borrowed from another rig in the station, was bolted on the back of the lower panel.

Since three frequency conversions are used, and the signal is at

A rear view of the s.s.b. exciter shows the relatively simple lash-up required to get going. The entire unit was built from scratch in less than a week, with no attempt to make the thing beautiful. Most of the parts will be readily identified by comparison with the several wiring diagrams.

QST for
Additional Amplifiers

It is to be assumed that more than the 10 watts of s.s.s.c. energy furnished by this exciter will be wanted at the average station, although this exciter will compete very well with conventional rigs having about 10 times the output. The mere mention of a Class B r.f. amplifier seems to put the damper on the enthusiasm of most amateurs, but it shouldn't be so. Very few hesitate to use a Class B audio amplifier as a modulator, and they seldom run into trouble. Any amplifier following this exciter should operate in the same manner as a Class B audio amplifier, since the carrier has been completely suppressed. Any tube that is suitable for r.f. applications will work well, provided it is properly neutralized and the operating voltages set as for Class B audio work. The ratio of peak to average power in speech being about 10 to 1 (depending upon the voice and microphone), quite high peak output can be obtained with low plate dissipation. Although the theoretical maximum efficiency of this type of amplifier is 78 per cent at full output, even the actual peak operating efficiency of 50 to 65 per cent will compare favorably with any Class C amplifier. As in all Class B amplifiers, the efficiency is proportional to the exciting grid voltage, within the range of linearity.

A pair of 811s or 805s would make an excellent final amplifier, although a single tube is just as satisfactory. The use of zero-bias tubes eliminates

---

**Fig. 5** — Winding details of the L402 of Fig. 4. The primary consists of two strands of No. 32 d.s.c., close-wound parallel for a winding length of 2 inches. The secondary is 30 turns of No. 32 d.s.c., scramble-wound between two pasteboard rings. Several layers of writing paper are wound over the primary before starting the secondary. The coil is tuned with a 1-inch powdered-iron slug.

---

A low level most of the time, shielding is not necessary on the first two modulator units, other than the usual shield cans around the i.f. coils. The third-modulator assembly deals with frequencies near the output frequency and signals of a higher level, and so shielding between stages is essential. The high-frequency oscillator and multiplier are completely enclosed, and the 807 has its plate circuit on the front of the panel, and obviously not for aesthetic reasons!

---

**Fig. 6** — Wiring diagram of balanced modulator No. 3, the 14-Mc. filter and the 807 buffer stage.

---

L601 through L605 — 14 turns air-wound, 3/4-inch diameter, 0.35 inch long (B & W Miniductors). Link windings are 2 turns at ground ends of coils. L603 — Tuned to 13,665 kc. with mica compression trimmer. L607 — 18 turns No. 18 s.c.e., close-wound on 1/2-inch diameter tubing.

---

L608 — 9 turns No. 18 s.c.e., close-wound on 1/2-inch diameter tubing. L609 — 8 turns No. 18 s.c.e., close-wound on same tubing as L608, spaced 3/4 inch. RL3, RL4 — 6 turns No. 18 wound over 100-ohm 2-watt resistor. T401 — Same as T402, Figs. 4 and 5.
In the second stage (T40a, T40b, T40c, under modulation), this coil is tuned to do very well. If everything is correct, a reading should be obtained at the second-modulator plate for maximum output on the desired sideband, as for tuning, but there

First thing to remember is that nothing can be done without an audio signal! After the frequency of the first oscillator (9 kc. approximately) has been set, the carrier suppression, when the oscillators signal a small. 2.5- volt lamp can be coupled to the output tank of the S13s and it will show no sign of any r.f. But the experiment should be tried with the microphone circuit closed, because it doesn’t take much to burn out the bulb in a hurry!

Transmitter Tuning Procedure

The tuning of an s.s.s.c. rig is very straightforward and, incidentally, quite interesting. The first thing to remember is that nothing can be done without an audio signal! After the frequency of the first oscillator (9 kc. approximately) has been set, the carrier suppression, when there is no audio signal a small 2.5 volt diode lamp can be coupled to the output tank of the S13s and it will show no sign of any r.f. But the experiment should be tried with the microphone circuit closed, because it doesn’t take much to burn out the bulb in a hurry!

The second rig in this station used a pair of S13s in a neutralized push-pull final, as all that was necessary was to run a link from the s.s.s.c., exciter over to their grids and to short out the resistor bias in the S13 amplifier. The tubes are run with 600 volts on the screens, 2000 volts on the plates, and the bias is adjusted to give a zero-signal plate current of 40 ma. With full signal the plate current rises to 470 ma. The tubes show no color during normal voice modulation. To attest to the completeness of the carrier suppression, when there is no audio signal a small 2.5-volt diode lamp can be coupled to the output tank of the S13s and it will show no sign of any r.f. But the experiment should be tried with the microphone circuit closed, because it doesn’t take much to burn out the bulb in a hurry!

The second rig in this station used a pair of S13s in a neutralized push-pull final, as all that was necessary was to run a link from the s.s.s.c., exciter over to their grids and to short out the resistor bias in the S13 amplifier. The tubes are run with 600 volts on the screens, 2000 volts on the plates, and the bias is adjusted to give a zero-signal plate current of 40 ma. With full signal the plate current rises to 470 ma. The tubes show no color during normal voice modulation. To attest to the completeness of the carrier suppression, when there is no audio signal a small 2.5-volt diode lamp can be coupled to the output tank of the S13s and it will show no sign of any r.f. But the experiment should be tried with the microphone circuit closed, because it doesn’t take much to burn out the bulb in a hurry!

Procedure to switch rigs. This has worked in almost all cases, but occasionally we will get the report that the f.m. is not working! The second method is to call CQ, or another station, on single sideband and hope for the best. Surprising as it may seem, many contacts have been secured this way.

The third system, which incidentally places the transmitter in a queer mode of operation, is to feed a small amount of 9-kc. signal around the first modulator and filter unit and use this as a carrier. Plate dissipation on the final-stage runs high this way, and the allowable power output is cut down.

(Continued on page 88)
Any DX Today?

M.U.F. — The Time, Distance and Direction

BY D. W. HEIGHTMAN, * G6DH

With no more complicated apparatus than a sensitive general-coverage receiver for 25-60 Mc., plus a reasonable amount of commonsense, much can be learned about the vagaries of that somewhat elusive medium on which we chiefly depend for our DX communication — the ionosphere. While most of us are probably interested in the effect rather than the cause, from a practical standpoint, we can also save much wasted time and watts by knowing roughly what frequency band to use, and when to use it, for any particular direction and distance. We can also, if we are so minded, take advantage of DX openings in the 5-, 6- and 10-meter bands which have, unfortunately, in the past been so frequently missed by many of the amateur fraternity.

The following is, then, an effort to indicate in simple terms the methods to follow in making these checks on "conditions," and also a record of past observations of the writer and others — which records always serve as a useful indication as to what may happen in the future. There are now many references in textbooks and other publications to the subject of ionospheric propagation but, in order that we should have a fairly clear picture of what we are talking about, the main features will be summarized as we proceed.

Ionospheric Layers

Primarily, of course, we rely on the fact that the upper atmosphere is ionized, chiefly by the sun's radiations, and for this reason the main factors in deciding conditions prevailing at any particular time over a given path are the position of that path on the earth in relation to the sun, and also the intensity and type of radiation received from the sun at that time. The relative importance of corpuscular as opposed to ultraviolet-wave ionization of the upper atmosphere is not at all clear at the present time.

The ionization is normally somewhat stratified in what we know as E, F, and F2 layers with a D region below the E, and "sporadic E," clouds of very high ionization about the E-layer height. The maximum ionization in the E region occurs at a height of about 100 km. while the F1 is concentrated around 200 km. and F2 350 km. At nighttime and in winter daytime F1 and F2 combine to form a single F layer around 250 km. These heights are, of course, subject to day-to-day variation.

On frequencies over, say, 25 Mc., signals are reflected chiefly in the F2 or F region, because the ionization density is greatest there, particularly in winter months. In the summer period however, from May to August in the northern hemisphere, the sporadic-E ionization is often of such intensity as to reflect signals of higher than 60 Mc., while the F2 ionization is very much less than in winter. The accepted method of measurement of virtual height of the layers and, indirectly, of the ionization density, is to send short-wave pulses up vertically to the ionosphere and measure the elapsed time until the reflected waves are returned to the sending point. The time taken, go and return, is shown on a cathode-ray tube and hence the effective height of the layer can be ascertained. As the frequency is increased, we reach the "critical frequency" at which signals are barely returned, while any higher frequencies pass right through the ionized region and are not reflected, unless there is a layer above having a higher ionization density. Thus we refer to the critical frequency of a layer rather than its ionization density, and the critical frequency gives us an index to conditions prevailing overhead at any particular time.

* 234 Burra Road, Clacton, Essex, England.

January 1948
For low-angle (horizontal) transmission the highest frequency returned to ground (some distance away) is obviously much higher than the critical frequency (for vertical transmission), since in this case the amount of bending required is much less. The highest frequency we can use for a given distance at any particular time is called the maximum usable frequency (m.u.f.). Obviously, the maximum distance we can cover in one hop will depend on the layer height and the effective height of the transmitter and receiver. The question of distance and m.u.f. is discussed in more detail later. When we refer to m.u.f., unless otherwise stated, we mean the m.u.f. for the most favorable distance (generally about 3000-4000 km. for the F2 layer). The m.u.f. for a shorter or longer distance would be less.

**Amateur M.U.F. Checks**

While for obvious reasons the average amateur cannot measure the critical frequency he can, quite easily, obtain a reasonably accurate check on the m.u.f. by the simple expedient of tuning on his receiver upward from, say, 25 Mc., and continuously until no further signals are heard, noting the highest-frequency signals received.

Nowadays, there are so many transmitters, in various parts of the world, operating on the higher frequencies or producing harmonics in the 30-60 Mc. region that one can be practically certain of receiving some sort of signal almost up to the m.u.f. Many commercial telegraph stations oblige by sending their calls at frequent intervals preceded by "Va" or "QRA de," which is, of course, a very useful feature. The fact that near the m.u.f. the attenuation of signals because of absorption and other effects, is least, is of assistance, in that the signals checked need not have high power.

Initially, it may be found a little tedious, identifying and locating the various signals heard (especially when they are high-speed commercials!) but with a little experience one soon gets to know the "regulars." The acquisition of a copy of the *Berna List*, which gives locations and frequencies of almost all stations throughout the world, is very helpful in this respect. It is also essential to learn to differentiate between comparatively local ground-wave or tropospheric signals and the DX ones.

A long-wire antenna, part vertical and the rest horizontal, has been found quite suitable for this general-coverage reception. Care should be taken, however, to see that the antenna used does not have dead spots in the frequency range to be observed.

It will generally be found best to locate check signals every two or three megacycles, from about 25 Mc. upward, and from directions roughly at each of the eight compass points. Once these signals are known it need only take a few minutes to get a reasonably accurate check on prevailing conditions and possibilities.

The writer's records, discussed below, have been obtained using the above simple methods. Compared with measurement of critical frequencies this system of checking path m.u.f. has one distinct advantage, i.e., the critical-frequency measurement only tells us the state of the ionosphere immediately overhead (and not where our signal will meet it some 1200 miles distant) whereas the m.u.f. check is made under actual working conditions. Critical-frequency measurements therefore involve some prediction of path m.u.f. an hour or two ahead.

### Factors Influencing M.U.F.

As we already know, the m.u.f. will be dependent on time, location, distance and direction. It is convenient to go into rather more detail under these subheadings:

**Time:** In addition to minor, continuous and unpredictable variations in m.u.f., there are average long- and short-period changes which occur with some predictable regularity. First we have the solar-cycle variation, from maximum to minimum, of about five to six years. Fig. 1, from the records at G6DH, represents the average monthly P2 m.u.f. for all directions from the maximum in 1937 to the minimum in 1942. The considerable drop in m.u.f., particularly the winter m.u.f., from sunspot maximum to minimum is quite marked; so also, is the second seasonal change in m.u.f. already referred to above. Note the peak periods of February-March and October-November.

The fact that the F layer has a greater ionization density in the winter months is a somewhat unexpected result. One might expect, with the northern hemisphere coming more directly under the sun's radiation in summer, that ionization would be greater in summer.2 The E layer

2 The sun is actually closer to the northern hemisphere in winter than in summer. Its lesser heating effect is the result of the low angle at which it strikes the earth's surface. —Ed.
follows the expected trend, however. From midwinter up to about February the average $F$-layer ionization increases; thereafter, coincident with the splitting of the $F$ region in daytime into $F_1$ and $F_2$ layers, the $F_2$ ionization drops, reaching a minimum in midsummer. By October–November it reaches another peak and then lessens somewhat toward midwinter.

This description of seasonal variation applies to the northern hemisphere. The situation in the southern hemisphere will be more or less opposite but does not yet appear to have been clarified and the observations of people working on similar lines “down south” would be welcome. It is also interesting to note from Fig. 1 that the variation in m.u.f. is far less marked from winter to summer in sunspot-minimum years: a bare 10 per cent instead of 60 per cent or more.

According to the writer’s experience, sporadic-$E$ occurrence over $30 \text{ Mc}$, also peaks in sunspot-maximum years, although the CRPL Propagation Handbook mentions an “apparent increase in sporadic-$E$ occurrence with decreasing sunspot number.” Generally speaking, it is apparent that further evidence is necessary in respect of sporadic $E$, before conclusions can be drawn. Comparing June and July 1937 with the same months in 1942, the number of days on which sporadic-$E$ reflections were observed by the writer on or over $50 \text{ Mc}$, was: 1937 — June, 7 days, July, 11 days; 1942 — June, 2 days, July, 1 day.

Another point is that if we acknowledge, to some extent, a 27-day cycle in $E_2$ (sporadic-$E$) occurrence, then this must be attributed to sunspots. This being so, $E_2$ would be expected to peak in sunspot-maximum years. As has already been mentioned, sporadic $E$ peaks in the spring and summer months.

The third cyclic variation — generally not too reliable — is that caused by the sun’s rotation, approximately 27.25 days. If there has been an abnormally high peak in m.u.f. on any particular day and path this will generally be caused by increased radiation from the sun occurring near a sunspot or spots. Hence, if there are no great changes on this particular part of the sun’s surface on the next solar rotation, similar peak conditions may be expected. Unfortunately, since the sun’s radiation varies between extremely wide limits over a comparatively short distance in the spot area, it may well happen that instead of a peak in conditions an ionosphere storm or other disturbance occurs with the next rotation. Also, because of this very variable radiation, peak conditions may occur over one part of the earth while, over another part, conditions may be subnormal. Matters will, obviously, also become complicated if there are several sunspots in fairly-close proximity.

This 27–28 day trend can be followed, to some extent, from Fig. 2, which shows variations in the $F_2$ m.u.f. to the U.S.A. during the winter of 1946–47; also from Fig. 3 showing the $E_2$ openings of the summer of 1947. The 27–28 day cycle is considerably more apparent from B of Fig. 3 where times and daily durations are considered. Note particularly the similarity of the patterns of the June and July peak periods. Looking at A of Fig. 3, which only gives the daily peak frequencies, one can see little evidence of this cycle. At best, all we may say is that the 27-day cycle gives us a reasonably good guide as to when we may expect a repetition of conditions, good, bad or indifferent. This is particularly true if only one or two repetitions are taken into account and suitable revisions in predictions are made as each cycle occurs.

Fourthly, we have the diurnal or daily variations in m.u.f. Fig. 4 gives examples of the trend of the $F_2$ m.u.f. through the day for different directions on various types of days, disturbed and otherwise, in England.
The rise in m.u.f. is often extremely rapid. In the early mornings particularly, for instance, within 10 to 20 minutes it will rise from 25 to over 40 Mc. On some days this steep gradient is continued up to near 50 Mc., remaining there for maybe 10 minutes and then dropping to the 40-45 limit again. On other days, there will be a steep increase to 40-42 Mc. after which the curve flattens to remain at this value. There may then be a later sharp peak from this frequency to 50 Mc. or thereabouts. Yet other days show several fluctuations between the 40- and 50-Mc. limits. Generally speaking, one of the best indications of a good day for 50-Mc. DX will be an early and sharp m.u.f. built up at dawn. It is found, also, that prolongation of the decline in evening m.u.f. to the west means that the following day will be good. This fall in m.u.f. can be so gradual that the 28-Mc. band remains open two hours or more after average closing time.

It frequently happens, under stable conditions, that on mornings when the m.u.f. is high to the east similar conditions are repeated in the afternoons to the west. In other words, stations on similar latitudes experience similar east-west m.u.f.s on any particular day though, of course, minor fluctuations take place. This fact can give a four-hour warning of high westerly m.u.f. If, for instance, we find in England high m.u.f. to Russia in the early morning, the same pattern can be expected to be followed to the U.S.A. direction in their early morning, which is early afternoon in England. A, of Fig. 4, is a good example of this. Under disturbed conditions, however, the opposite may be true — a complete blackout to the east with the western m.u.f. or vice versa.

Apart from a week or two at the equinoxes, it seldom occurs that the m.u.f. is high north and south of the equator simultaneously. This fact has often been made apparent from the daily reports on the m.u.f. in South Africa at Z51P (given on 23.3 Mc. at 1100 GCT). When he has reported, say, 47-Mc. m.u.f., often, in England, the m.u.f. has been found to be ten or more megacycles lower.

It is interesting to note that on ionospherically-disturbed days when the m.u.f. to the northeast and northwest directions is extremely low, sharp peaks occur in the m.u.f. to southerly directions, especially around midday. Examples of such days during 1947 were March 26th, 29th, and October 11th, 15th, when PABUN, Elmdon, Holland, was received in Cape Town and South African signals were received in England. On the other hand, however, there have been one or two days, notably October 6th and 17th, when again South African stations were received in Europe, on which the northwest m.u.f. was fairly normal and no apparent ionospheric disturbance was taking place. We can only conclude therefore that while under disturbed conditions the north-south m.u.f. is likely to be high, such conditions are not necessarily essential for high north-south m.u.f. B, of Fig. 4, shows the sharp midday southerly peaks of a disturbed day with extremely-low morning and evening m.u.f., and low m.u.f. east and west.

Under disturbed conditions it appears, at times, that sporadic E is playing a considerable part in propagation because the received signals have the characteristics of those normally received by this form of reflection, i.e., very strong peaks but spasmodic in appearance. Presumably, part of the path is covered by F2 reflection and E fills in the gaps.

Considering E daily variations, Fig. 3-B depicts the times and directions of occurrences observed at G6DH during the summer of 1947. From this it will be obvious, as is well known to those who have worked on the 5- and 6-meter bands, that E follows no definite pattern and it
Examples of daytime $F_2$ m.u.f. variations for various directions. A is an example of a very good day for U.S.A.-Europe on 50 Mc. Note rapid build-up in early morning, the W.N.W. outline running parallel to the earlier E.N.E. one. The S.E. and S.W. m.u.f. are not very high. B and C are examples of days having northerly ionospheric disturbance. Note the very low E.N.E. and W.N.W. m.u.f., yet high peaks in southerly directions, first to S.W., then to S.E. E is the m.u.f. outline for Nov. 24, 1916, when the 50-Mc. signals of W1HDQ were first heard across the Atlantic. D is a normal day in June, 1947.

is not possible to give any accurate predictions of occurrence. The early evening from 1700 to 2000 generally, however, provides the majority of openings.

From the foregoing it will be gathered that it is not possible to forecast exactly at what time the m.u.f. peak will occur over any particular path on a particular day but it is normally possible to estimate this within an hour or two. While in the winter months the peak will occur when it is about midday, at a point midway over a given path, with the approach of summer there tends to be a drop at midday with peaks at morning and evening.

**Distances:** During the winter of 1946-47 it was found that the optimum distance for $F_2$ transmission, over 45 Mc., was of the order of 2500 miles, being a minimum in midwinter and increasing toward the equinoxes, coincident with the increase in layer height. Signals observed were generally from directions between E.N.E. and S.E. from England. While the m.u.f. was probably similar in the opposite directions, unfortunately the optimum distance brought us to mid-Atlantic with no signals for checking purposes. The m.u.f. for distances over 2500 miles was almost always less.

The distance of 2500 miles (or 4000 km.) is generally accepted as the maximum distance for single-hop $F$-layer transmission, based on the average layer height and the maximum distance covered by a signal leaving almost tangentially to the earth's surface. There would appear to be no reason why double-hop $F_2$ transmission in the 45–50 Mc. region should not take place but, apart from north-south trans-equator transmission about the equinoxes, the distribution of sunlight is, normally, too irregular to allow this to take place; i.e., while the m.u.f. at one end may be high, at the other it is too low.

Any very-long-distance contacts that have taken place on 50 Mc. have all been of the trans-equator type (i.e., over 5000 miles). More recent tests with 50-Mc. South African stations have tended to show that prolongation of the distance covered may be brought about by combinations of $F_2$, sporadic $E$, and also tropospheric reflection.

The average sporadic-$E$, skip distance over 50 Mc. during the summer of 1947 was 750 miles while the maximum coverage was 1300 miles. There was almost no evidence of double-hop transmission.

An additional and useful factor in checking the m.u.f. can be the observation of the skip distance

2. The "control-point" theory, upon which propagation predictions are based, denies the existence of double-hop $F_2$-layer propagation. It assumes a control point 1200 miles from either end along the great-circle path between two stations in question. Regardless of distance, then, $F_2$ propagation will take place if the m.u.f. at the two control points is up to the frequency in use. The minimum distance will be the author states, something in the vicinity of 2500 miles, but the maximum may be anything. Propagation beyond the control point is assumed to be analogous to that in a wave guide, and the signal may be heard at any point beyond twice the control-point distance. — Ed.
(i.e., minimum distance over which strong signals are received) on, say 28 Mc. In this respect the writer has found the following approximation to be sufficiently accurate:

\[ F_2 = \frac{280}{d} + 15.5 \]

where \( F_2 = 2500 \) miles m.u.f. (i.e., the highest m.u.f.) and \( d = \) skip distance in hundreds of miles on 28 Mc. From this it will be seen that for 50-Mc. propagation to be possible over 2500 miles the skip on 28 Mc. should be down to 800 miles \((F_2 = 280/8 + 15.5 = 50.5)\). In using this check care should be taken not to confuse sporadic-E, rebound, and other types of signals with true \( F_2 \) ones. Also, the formula is only reasonably accurate for 28 Mc., there being a great deal of difference between skip at either end of the amateur 28-29.7 Mc. band.

**Location:** Generalizing from the NBS and other prediction charts, the highest m.u.f. occurs north and south of the equator in the 20° latitudes, with a progressive and gradual drop as the latitude becomes higher north or south. An unexpected and very considerable drop in m.u.f. frequently is shown to occur over the equatorial regions, with a very steep gradient from the north and south of the equator in the 20° latitudes. On this basis, stations in the 20°-30° latitudes should (during sunspot-maximum years) be ideally situated for contacts on frequencies of the order of 50 Mc., especially over 2500-mile paths running parallel to the equator. Unfortunately, from this point of view, activity of stations in these parts of the world on frequencies over 30 Mc. has been very low in the past. However, it now seems that a good deal of interest is being shown and with consistent activity we may hope for some very interesting results, some already having been obtained, particularly by our friend, Major Ken Ellis, MD5KW, operating currently on 50 Mc. in the Suez Canal zone.

M.u.f. observations are always complicated by the irregular distribution of land over the globe and the lack of activity in certain parts. Hence the more regular activity we can get the sooner of these matters will be supplemented. In this respect the short-wave listener could contribute much useful information — far more than in sending QSLs to 14-Mc. DX stations who don’t need or want them.

Paths running near to the magnetic poles of the earth are subject to fairly frequent interruption because of ionosphere storms, and, except under abnormal conditions, do not have high m.u.f.; hence contact with countries in northerly latitudes or over long distances, where the great-circle path passes higher than the 60° latitude, is unlikely over 40 Mc.

Recent 50-Mc. openings have shown that reception of distant stations can vary considerably at stations only 50 or 100 miles apart, so much so that at one station the signal may be inaudible and at the other 9! This is reminiscent of sporadic-E summer conditions when, on 58.5 Mc., the writer has been able to hear other amateurs 60 to 70 miles away working stations 1000 miles distant which were quite inaudible at his station. As an example of the importance of location, it has been particularly interesting to compare the results obtained by G5BY at his excellent location on the southwest coast of England and those of the writer, G6DH, 230 miles E.N.E. of G5BY, on the southeast coast. G5BY’s latitude is 50° 20’ and that of G6DH 51° 50’. Referring to m.u.f. prediction charts one finds that between the 50° and 60° latitudes there is an average downward gradient in m.u.f. of 0.8 Mc. per degree; i.e., G5BY’s m.u.f. to the United States should be approximately 1.6 Mc. higher than that of G6DH. Working with the m.u.f. limit a bare 50 Mc. this fact has often been amply borne out in practice! When at G6DH, W1HDQ (an ideally-situated station with excellent antenna array) is perhaps weakly received for a few minutes at a peak period, it will generally be found that G5BY has had a good opening to U.S.A. for maybe an hour or two! The fact that G5BY is also nearer to U.S.A. by 200-odd miles is also undoubtedly of importance since the optimum distance is of the 2500-mile order and from G6DH the nearest U.S.A. stations are 3250 miles. A somewhat similar example at the North American end of the trans-Atlantic path is the comparison between the signals of VE1QZ, Halifax, Nova Scotia, and the Ws. VE1QZ is usually heard first, and often loudest, during 50-Mc. openings, his distance from England being closer to the 2500-mile optimum than any of the Ws.

In the other direction G5BY also has scored. During the course of many 50-Mc. tests with MD5KW in the Suez Canal zone, on a number of occasions G5BY would report MD5KW S9 when the signal was absolutely inaudible at G6DH (even though the m.u.f. in that direction was at least 50 Mc.). In these instances it appears that G6DH is too close to MD5KW — distance 2100 miles. PA8UN has, also, on several occasions, not been able to receive MD5KW who is 1950 miles from him, when G5BY was actually receiving him O.K. G5BY is approximately 2300 miles from MD5KW. Up to Nov. 9, 1947, MD5KW had been received only twice at G6DH for short periods at fairly weak strength.
On Nov. 10th, however (when MD5KW made his first 50-Mc. G two-way QSO with G6DH), the signals were S9-plus at G6DH. In this instance it appeared that E₄ was assisting and reducing skip distance.

To U.S.A. the results of PA8UN (180 miles east of G6DH) compare similarly to those of G6DH, possibly not quite so well at times, which is, of course, to be expected, because of the greater distances involved.

**General**

During recent 50-Mc. openings, to U.S.A. particularly, the opportunity has been taken to check the spectrum from 30 to 50 Mc. with a view to obtaining indications for future openings. Generally it is found that up to about 42 Mc., many signals from all parts of the U.S.A. are "pounding" in. From 42 to 45 Mc. the number of strong signals thins out noticeably, then from 45 to 50 Mc. there may be only two or three not-very-strong signals. On some occasions, with 50-Mc. Ws coming in, there have been no other signals received over 45 Mc., although others (such as the f.m. broadcasters, etc.) were known to be operating. In other words, as we approach the m.u.f., reception becomes more and more selective as to distance and direction. This, no doubt, is attributable to the fact that only a "small patch" of the "sky" is reflecting the signal to which we are listening for all too short a period; often maybe for only 5 to 10 minutes.

In watching the m.u.f. build up from 6:30 A.M. EST it has been observed on several occasions, during checks with W1HDQ, that a 15.95-Mc. f.m. broadcast station (call not copied but presumably on northeast coast of U.S.A.) would come in for about 5 to 10 minutes, then go out, as if the m.u.f. were dropping again. After about 15-20 minutes of this occurring the m.u.f. would be found to have increased to 50 Mc. and W1HDQ could be received, still with the 46-Mc. f.m. inaudible! Presumably under these conditions the 46-Mc. signal is coming down at a shorter distance as the m.u.f. rises. On afternoons when the m.u.f. has not gone up to 50 this signal has remained in, often at very good strength! Hence m.u.f. build-up can be extremely deceptive!

On Oct. 17, 1947, both PA8UN and the writer were receiving South African 50-Mc. amateur signals for a short period around 1200 GCT but there were no other signals over 43 Mc. at this time. Had we, therefore, been making a normal m.u.f. check we would have not thought it possible to work as high as 50. On the other hand PA8UN reports that on Oct. 11th, during a 50-Mc. contact with ZS1P, there were several other commercial, etc. signals over 48 Mc. to indicate the opening which, he said, was reminding him of sporadic E because of the deep fading and strong peaks. At the time G6DH could find nothing over 37-38 Mc., yet G5BY was receiving the South African O.K.

Another indication of the presence of high m.u.f. has been the reception by E₃ "rebound" of stations, within the skip zone, operating around 41-46 Mc. It is normally found that such signals can be received up to within 4-5 Mc. of the m.u.f. At G6DH, for instance, the Paris television on 42 and 46 Mc. (210 miles distant), Stockholm f.m. broadcast on 41.6 (850 miles), and Copenhagen f.m. broadcast 41.25 (550 miles) served as useful indicators. If a bearing on the direction for maximum signal can be obtained, this will also indicate the zone where the m.u.f. is highest, as this is sometimes difficult to ascertain by other means.

**A 50-Mc. WAC?**

It is interesting to speculate on the possibility of working all continents on 50 Mc. So far as European stations are concerned the writer considers that, with the possible exception of the Australasia contact, this *would have already been possible* with conditions prevailing on a few days from October to December, 1947, and should again be possible during the period January to March, 1948. Unfortunately, there has been little or no consistent activity in some of the most-favored countries. For European stations, activity for the Asian contact is most desirable in India or Iraq. There is no doubt that contact with VU could have been made on several occasions and even more so with Iraq and other countries in that direction.

Australia to Europe would present the biggest problem and a suitable path will probably only occur from Western Australia since this path passes nearer the high-m.u.f. equatorial zones than that from VK2, etc. This path should be most favorable on a few days in the February-March October-February periods.

Africa has already been contacted, leaving South America to be considered. Here again it is believed that on at least two occasions during early November, 1947, contact could have taken place from Europe to South America. For instance, on November 8, 1947, from 1410 to 1435 GCT, HK05, Bogota, Colombia, harmonic on 48.2 Mc., was a good signal; on November 9th, from 1615 to 1645, ZXK2, 48 Mc. (Brazil), was quite consistent, and again on November 14th, HK05, 48.2 Mc., was received from 1415 to 1435, with other southwest signals coming in around 47 Mc. until 1615. There was, on these days, every indication of a 50-Mc. opening to South America but no amateur signals were heard.

(Continued on page 130)

---

An Easily-Adjusted VFO
Hints on Cleaning Up the ECO Signal

BY HARRY G. BURNETT,* WILZ

BEFORE the tools were lined up to build this variable-frequency oscillator, time out was taken to dig back through past issues of QST and the handbooks. Some smart amateurs have done some heavy thinking on VFOs, and the articles listed in the bibliography at the end of this article proved very helpful. Most of us have a very natural desire to begin where the other fellow left off.

Since the VFO in the 1947 edition of the ARRL Handbook seemed a logical starting point, this one began originally with that circuit — and then grew like Topsy. VFOs with few exceptions seem to be really driver units. The idea of a simple crystal substitute consisting of an electron-coupled oscillator and two isolation stages looked better. After all, this was to be primarily a frequency-determining device.

A glance at the photographs and at the circuit diagram of Fig. 1 discloses that the power supply is external to the VFO, to minimize heat and vibration. All tubes are miniatures — a 6BA6 (miniature version of 6SG7GT) and two 6AK5s. (Type 6AR5 — miniature version of 6K6GT — may be used for the second isolation stage, if more output is required.) They are mounted so as to protrude horizontally through the rear of the cabinet to keep the heat, as much as possible, away from the oscillator tank circuit. The many variable controls appearing in the circuit diagram are innovations which make the unit easy to adjust.

First consideration of VFO design appears to be frequency stability. Coil L1 is designed for a high C/L ratio because of this. It should be space-wound and very thoroughly doped to avoid humidity effects. If you can find a suitable ceramic form, use it in preference to a phenolic form which usually has a poor coefficient of expansion and, because it is not white, does not reflect external heat so well.

The rugged, double-bearing main tuning condenser, C1, is just large enough to cover the 80-meter band with a slight overlap at each end of the band. Condensers C3 and C4 are zero-temperature-coefficient padders which give the circuit a high Q and good frequency stability. Trimmer C2, which sets the band on the dial, is adjusted for minimum possible capacitance by increasing the value of C4 to the maximum value which still permits use of the trimmer for band-setting. This is done by building up the capacitance C4 with two or more paralleled zero-temperature-coefficient condensers. The trimmer C2 has sufficient capacitance to cover 3395-3900 kc. for multiplying to the 10- or 11-meter bands.

Condenser C5, controlled from the front panel, is a two-plate variable. The stator plate is adjustable on threaded rods to the desired spacing. Normally, this trimmer is set at midscale. A flick of it to the stop at either minimum or maximum capacitance then quickly shifts the fre-

C1 — 100-µfd. variable (Bud CE-2004).
C2 — 75-µfd. trimmer (Hammarlund APC-75).
C3 — 200-µfd. zero-temp. padde (Erie Ceramicon).
C4 — 50-µfd. zero-temp. padde (Erie Ceramicon).
C5 — 3-13-µfd. neg-temp. trimmer (Erie Ceramicon.
C6 — 2-plate variable, rebuilt National SS-35 (see text).
C7, C8, C9 — 100-µfd. mica.
C10, C11, C12, C13 — 0.01-µfd. mica.
C14, C15, C16, C17, C18 — 0.1-µfd. paper.
R1, R2 — 47,000 ohms, 1 watt.

Fig. 1 — Circuit diagram of W1LZ’s VFO.

Frequency to a predetermined one on either side of the main frequency. Of the straight-line-capacitance type and connected across an already heavily-padded circuit, the condenser gives approximately equal frequency change for each degree of rotation. This vernier is also a handy convenience for very fine adjustments in frequency.

**Negative-Temperature-Coefficient Trimmer**

Condenser C5 offers a new slant on temperature compensation, because it is a variable negative-temperature-coefficient condenser. Ordinarily, the amateur is not sure of the exact amount of capacitance he requires for final negative temperature compensation, and he is inclined to skip this finishing touch. The variable trimmer shown can save him some tedious computation and experimentation.

Tolerance for the temperature coefficient of this Erie Ceramicon trimmer is ±100 parts per million per degree C. or ±20 per cent, whichever is greater; whereas, a fixed Ceramicon has a tolerance of ±30 parts or ±15 per cent, whichever is greater. It is apparent that for most amateur purposes, the performance of the trimmer approaches sufficiently that of the fixed condenser. If the slightly greater stability of the fixed condenser is desired, however, the needed capacitance can be determined by first using the trimmer and adjusting it for proper compensation. The trimmer may then be removed from the circuit and measured on a capacitance bridge. Finally, a fixed condenser of the same capacitance and temperature coefficient may be soldered into the same position formerly occupied by the trimmer.

This condenser is mounted just over the oscillator coil, but perhaps a better location would be inside the coil, to avoid the effects of sudden drafts. It is wise to experiment with each particular layout to determine the most effective spot for temperature compensation. In general, this compensating condenser should be mounted as close as possible to the component causing most of the frequency drift — usually the coil — to assure that temperature changes of that component and the compensator will be fairly equal. Care should be taken not to mount the compensating capacitor on the chassis itself, because temperature variations of the chassis are likely to be different from those of the surrounding air.

A frequency meter offers the best means of determining the proper capacitance setting (which will probably vary with each installation) of the negative-coefficient-condenser, but if one is not available, the VFO can be tuned just outside the band and its signal beaten with that of a stable commercial signal picked up on a thoroughly-
warmed receiver. Proper adjustment of the trimmer can be determined by varying the temperature of the VFO unit over as wide a range as possible for each experimental setting of the condenser. Any means of raising or lowering temperature may be used, but care should be exercised not to force a draft of air into the VFO. If more negative compensation is needed, the 430 µfd. Type N500 TS2A may be a better choice than the one shown.

Unless your receiver is really stable, you can, by using this trimmer and the other means of frequency stabilization recommended in this article, attain stability so good that the receiver “walks away” from the ECO. Some of you have probably concluded that this type of negative-coefficient trimmer would be helpful also in stabilizing a frequency meter or the h.f. oscillator of the receiver.

**ECO Heater Voltage**

Another unusual kink which contributes noticeably to frequency stability is the variable resistor $R_3$ in series with one of the heater leads of the 6BA6. Reduced heater voltage has been used in telephone applications, for long life, and in high-gain audio stages for minimum hum. Provided — and this is important — the cathode current of the ECO is low, the same advantages of long life (desirable when the oscillator is to be calibrated) and low hum can be enjoyed with an ECO. More important, reduced heater voltage means less heat and consequent frequency drift.

To supply the required cathode current of 0.5 to 2 ma. at a plate voltage of 150, the lowest safe heater potential for the 6BA6 in this special application is considered to be 4.5 volts (at this potential, power dissipated by the heater is only 50 per cent of normal) with the key closed. Keeping in mind this limitation, adjust resistor $R_3$ to give the lowest voltage consistent with stable operation. Bear in mind that if the heater voltage is made too low, instability may result from variations in cathode emission.

**Cathode Tap**

Much has been written about the criticalness of the cathode tap. In general, it should be as low on the coil as possible; try 3, 4 or 5 turns from the bottom. For each tap tried, snap the gang switch back and forth between Points 2 and 3 to cause a change in applied voltage. An increase in frequency when the plate voltage is dropped indicates the cathode tap is too high on the coil; a decrease in frequency, that the tap is too low. The thought of fussing with quarter-turns to locate the final critical point to tap was not pleasant, and an easier way was sought to make the final feed-back adjustment.

**Variable Grid Leak**

Rereading of Terman on oscillators confirmed the belief that the value of the grid leak had a pronounced interlocking effect on excitation. A variable high-resistance grid leak, $R_2$, seemed to be the answer. The 47,000-ohm fixed resistor, $R_1$, was connected in series with the variable 1-megohm resistor, $R_2$, to prevent accidental adjustment of the grid leak to zero, and to keep r.f. out of the wiring to the variable resistor. Much less fussy adjustment of the cathode (tap is necessary with this arrangement because the variable grid leak permits fine adjustment of the feedback in a less painful manner. Set this grid leak at as high a resistance as possible to increase the tube impedance, but be careful not to introduce too much grid resistance or you will block the oscillator and start a series of “birdie” oscillations all over the band.

**Variable Screen Controls**

Another much-discussed adjustment of the ECO is the proportioning of plate to screen voltage. A 50,000-ohm (a lower value would produce more heat and is considered unnecessary when using a well-regulated supply) variable control of the potentiometer type, $R_4$, is used. This permits quick, exact adjustment of the screen potential directly from the front panel. Note that the resistor $R_4$ is inserted in series with both screen and plate potentials of the 6BA6 when $S_1$ is in the second position. Since the resistor is out of the circuit when the switch is turned to the third position, it is easy to determine the effect on frequency of comparatively large variations in applied plate and screen potentials when the switch is snapped back and forth between these two taps.
Frankly, it was found difficult to proportion the screen and plate potentials to achieve the sort of compensation originally recommended by Dow. For a comparatively narrow band of frequencies, compensation is possible; a 3:1 voltage ratio seems about right. A regulated power supply, however, makes exact proportioning of plate and screen voltages much less important. The screen control, nevertheless, is a very handy gadget for minimizing oscillator input closely to that required to give sufficient drive to the following stage.

Experience with the convenience of the oscillator screen control led to the installation of variable resistors $R_7$ and $R_{14}$ for the screens of both the isolation stages. The large resistor $R_7$ in the screen of the first 6AK5 is necessary to avoid overexciting the grid of the next stage. To begin with, these controls can be set to give a screen potential of 120 or 140 volts (dependent on whether the plate potential is 180 or 150 volts). Then final precise adjustments may be made by watching a grid meter in the stage following the VFO. Be careful to avoid exceeding the absolute maximum screen dissipation (0.5 watt) of the second 6AK5.

**Power Switching and Metering**

It might be well to point out here the versatility of the three-gang switch, $S_1$. The six positions are: (1) all d.c. potentials removed, (2) oscillator d.c. potentials through a 22,000-ohm resistor (for varying applied voltage), (3) normal oscillator potentials connected, (4) d.c. potentials to oscillator and first isolation stage, (5) d.c. potentials to all three stages, (6) d.c. potentials to all three stages, but with the last two stages fed by the regulated pack normally used only for the oscillator, rather than by the power supply employed for normal keying of the transmitter. This last position permits tuning the complete VFO --- with a strong signal in the receiver --- without applying power to the remaining stages of the transmitter. A relay, powered when the regular transmit switch is thrown, can be used to open the negative lead to the oscillator during stand-by.

The meter jack, $J_2$, is wired in the negative lead to make easy the progressive metering of the additive cathode currents of the tubes as follows: oscillator alone, oscillator and first 6AK5, and all three stages. Do not ground the negative of the oscillator pack external to the VFO since this would short-circuit the metering jack. This also means that the VFO unit cannot be operated from a pack supplying the following stages. The gang switch and metering system really speed up initial testing and later adjustment of the unit.

**Keying**

Keying with a VFO is a problem. If the oscillator itself is keyed, it is virtually impossible to avoid both clicks and chirps simultaneously. Yet the break-in operation possible with oscillator keying is mighty desirable. The only real solution is to let the oscillator run constantly --- at reduced input --- and key the remainder of the transmitter. Oscillator input can be made very low (0.5 to 2 ma, total cathode current at 150 volts plate) and still give sufficient output to drive the high-gain first 6AK5. Precautions must be taken, of course, to minimize oscillator-signal leakage. Shielding of the tank circuit, the tube, and around the coupling lead to the grid of the first isolation stage, the power cable, and the output coaxial cable helps materially in cutting down the signal in the receiver. Double shielding of the entire unit, such as is common with signal generators, is fine if constructional problems can be overcome.

Next in importance to shielding is the judicious use of by-pass condensers and grounds. That is why condensers $C_{22}$ and $C_{33}$ were added at the point where the “hot” power leads enter the VFO. (These condensers serve a dual purpose, in that they tend also to prevent r.f. feedback into the VFO.) A condenser across the output terminals of the oscillator power supply also may be desirable when the ECO is powered by the receiver pack. If break-in operation of the transmitter is to be primarily on 80 meters, it would be wise to put the ECO on 160 or 320 meters.

At WILZ, plate cut-off primary keying (see QST for March, 1947) of all stages except the constantly running ECO works O.K. The keying is reported to be the same as when crystal control was being used. Oscillator-signal leakage into the receiver can be reduced to $S_1$ to $S_5$ dependent upon the effectiveness of the shielding and by-passing and upon the drive required for the following power stages. No trouble is experienced in working break-in with weak DX stations, particularly if full use is made of the i.f. selectivity of the receiver.

**Input & Output**

Although the cathode currents (key down) of all three tubes in the VFO total only 18 ma. (1 ma. for 6BA6, 6 ma. for first 6AK5, 11 ma. for second 6AK5), the output is sufficient to drive two 807 doublers (running at 300 and 500 plate volts respectively) hard enough to overexcite a 5514 with up to 175 watts input on 14 Mc. The low current drawn permits taking the voltage for the ECO from the same regulator tube which supplies the i.f. oscillator of a receiver, provided the sixth position of $S_1$ connects to a similar voltage separate from the receiver. Or --- if the cathode of the first 6AK5 is keyed, the entire VFO can be supplied from a single OD3/VR150. At WILZ, the same electronically-regulated pack used for the receiver gives really pure regulated d.c. for either the oscillator or the entire VFO. Incidentally, test the oscillator with a rather
poorly-filtered pack. If you can get a good d.c. note that way, your oscillator will perform beautifully when fed really p.d.c.

The lead is coupled by means of 52-ohm coaxial cable. For simplicity, capacitive coupling is used. Because the coaxial cable by-passes the output voltage to ground, the line is kept as short as possible (not more than 5 feet), and a comparatively large coupling condenser, $C_{01}$, is used to obtain a better voltage distribution. Ordinarily, the transmitter end of the “hot” output lead is connected directly to the grid of the driver tube. If there is parasitic trouble in the first driver tube, it may be better to connect the “hot” lead of the VFO output to the driver grid through a 10- or 20-µfd. mica condenser, as suggested by Hunter (cf., bibliography).

Parasitics and R.F. Feed-Back

With the VFO perking beautifully, it is quite likely that only half of the job is done. Hooking it up to the rest of the rig and keying it still remains a problem — particularly when there are many stages and high power. If you were born lucky, or if you have already done a thorough job of wiping out parasitics, r.f. feed-back, and improper neutralization, skip the next few paragraphs.

On the other hand, if you are still plagued with these troubles, here are some reminders and suggestions which may help. Read again what the Handbook and past articles in QST advise for eliminating parasitics. Make full use of shielding, v.h.f. chokes, suppressor resistors in grid, plate and screen. Avoid low-frequency oscillating circuits formed by similar grid and plate chokes, and by taps on grid or plate coils. Be sure that with no excitation, reduced fixed bias, and full plate voltage, the plate condenser of each stage can be tuned over the whole dial without any change in plate current, and without any grid current developing or r.f. showing when a neon bulb is touched to the plate coil. Remember also that some parasitics occur only when excitation is applied, and that parasites can develop in any stage of the VFO itself. Make one change at a time as you strive to get rid of them. With the receiver and monitor, check for spurious a.c. signals either side of your main frequency.

Watch out for tunable hum from mercury-vapor rectifiers — particularly from a bridge rectifier. It can usually be eliminated by r.f. chokes in the plate leads and/or by 0.002-µfd. buffer condensers connected between plates and cathodes. An adequate swinging choke and electrostatic shielding of the plate transformer also help to minimize this tunable hum.

R.f. feed-back headaches are usually worse with VFO than with crystal control, and a good monitor is invaluable in tracing their causes and eliminating them. Shield properly and keep the VFO out of strong r.f. fields. Notice that the plate-circuit components of this ECO are under the chassis shielded from the grid circuit. By-pass choke, (try chokes in negative leads), and ground to kill r.f. when it pops up in undesired spots in the transmitter.

Large noninductive mica by-passes (0.01 µfd.) with very short connections were employed for screen and heater of this ECO. Observe also the by-passing of the heaters of the 6AK5s with 0.001-µfd. condensers built right into the novel Cinch sockets. The old-fashioned method of by-passing both sides of all heaters, and then grounding the center-tap of the common filament transformer, was more appealing than grounding one side of all heaters to the chassis. R.f. has a nasty habit of appearing unexpectedly on a “grounded” chassis.

An example of how a little stray r.f. can ruin the note occurred with this VFO. The note was unstable; at times T9, at others T8. After days of searching for the baffling cause, it was found that grounding the bracket supporting the oscillator tube directly to the back of the cabinet cleared up the note. This connection was needed, despite the fact that the chassis and cabinet were already bonded together through the front panel. Screwy? For a good note, also be sure you put real p.d.c. on both oscillator and final; filter on the pack feeding the other stages is not so important, if you run well into Class C.

Watch your neutralization, too, particularly on the higher frequencies. Use short leads and a split-stator circuit to avoid regeneration; space and orientate properly, and shield if necessary, the coils of the tuned circuits; connect grid and neutralizing condensers by separate leads to the grid terminal of the tube. If the circuit is single-ended, balance the plate-to-cathode capacitance of the tube with a similar capacitance between ground and the end of the plate coil connected to the neutralizing condenser.

Bottom view, showing the arrangement of parts. The two potentiometers to the right are for adjusting the isolating-amplifier screen voltages. Near the center is the broadly-resonant choke, RFCq. The power switch, $S_1$, is to the left.
An excellent neutralizing indicator and one not likely to upset the normal balance of the stage being neutralized is the grid meter of the following stage. With fixed bias removed from this following stage, its grid-to-cathode circuit will act as a diode to rectify any r.f. leakage current from the previous stage. Adjust the neutralizing condenser for zero current on this grid meter with the plate condenser at resonance. For the final stage, a lamp and loop coupled to the antenna coil will serve the same purpose in neutralizing that stage. As has been pointed out often in QST, neutralizing is frequently the only way to tame a high-power beam pentode.

Construction

The cabinet is 10 inches long, 7 inches high, and 6 inches deep. The chassis is a simple "U" bent out of 1/8-inch aluminum stock 3½ inches long and 2½ inches high, with its depth made exactly right to give a snug fit against the rear of the cabinet. Notice the knurled 6-32 panel screws which make it possible to remove panel and chassis in a jiffy — without a paint-marring screwdriver. If extreme mechanical rigidity is required, two General Radio knurled 10-32 panel screws may be used to bond the rears of the cabinet and chassis together by insertion of the screws into tapped holes drilled through the backs of both cabinet and chassis.

The photographs show clearly the mounting of the parts. No attempt has been made to be fancy, but everything is securely tied down to avoid vibration. Mounting bracket for the 6BA6 oscillator tube is of 3/16-inch aluminum. The zero-temperature-coefficient condensers are soldered vertically into place at the rear left of the main tuning condenser. Note the negative-coefficient trimmer mounted just above the oscillator coil, the variable grid leak to the rear left of the oscillator coil, and the 6AK5 screen resistors mounted below the band-set trimmer at the rear right of the panel.

The special vernier, C4, is to the rear left of the main tuning condenser. A small stand-off insulator rigidly supports the grid condenser and its associated wiring. The milliammeter jack is screw-driven vertically into place at the rear left of the cabinet. Notice the knurled 6-32 panel screws which make it possible to remove panel and chassis in a jiffy — without a paint-marring screwdriver. If extreme mechanical rigidity is required, two General Radio knurled 10-32 panel screws may be used to bond the rears of the cabinet and chassis together by insertion of the screws into tapped holes drilled through the backs of both cabinet and chassis.

To minimize vibration, you probably will want to set your VFO on a sponge rubber mat cut from a kneading or typewriter pad. If you do, here's a tip. Use a sharp knife moistened with castor oil. You can then cut nice square edges; and the oil will not cause deterioration of the rubber. Keep your eyes open, too, for that new cellular rubber which has a little air bubble sealed up in each tiny cell. It should be ideal for this purpose.

Good luck to you in building or rebuilding your VFO. Let's hope this article offers you some usable ideas. Before you actually begin designing the VFO to obsolete all other VFOs, look up at least a few of the references given in the bibliography. You will find them very helpful.

Bibliography

Mix, "Electron-Coupled V.F.O. Crystal Transmitter Control," QST, April, 1936, p. 50.
Coaklin, "Frequency Meters as Master Oscillators," QST, August, 1946, p. 34.
Hunter, "Coping the VFO to the Crystal Stage," QST, July, 1947, p. 32.
ARRL Week and Member Party—Jan. 24th-25th

Sixth Annual Contest with 'Phone and C.W. Call-Pin Awards in Each Section

BY F. E. HANDY, * WIBDI

President Bailey will address a special message to ARRL members from WIAW and all OBS appointees during the week of January 18th. The entire League field organization will climax the observance of this ARRL Week on January 24th and 25th by participating in an operating party that features a simple scoring plan and call-pin awards. Fixed scoring credits will be given for radio reception of this message and/or qualification in the CP run of the 19th (or previous runs). These, with all contact points in the end-of-week party, multiplied by number of sections worked, constitute the participant's score.

**ARRL Week**

The ARRL Week idea implements our notion that during this week every good member will participate in some activity dedicated to general betterment of his ARRL. This is in the realization that our fraternity is “of, by and for” the amateur, and the sum of our prestige as an organization is in reality dependent on what we each make of our organization and ourselves as members of it.

We might each try to do one thing a day along different lines, pointed toward organization and self-improvement. Broadening our fraternal relationships and activities may be the best thing for ARRL Week observance. Ideas! Shift to 80 c.w. if you have worked only 2 (or vice versa), give yourself a week of pleasure in handling traffic or measuring frequencies, and go after some neglected ARRL awards in any field you have been neglecting. January is a good month for adoption of some New Year’s resolutions. An ARRL Week log might show items like the following:

- **Mon., 19th**: Copied code-proficiency run (WIAW-W3CO).
- **Tues., 20th**: Got caught up on QSLs; copied the G.W.B. (W2KII) message from ...  
- **Wed., 21st**: Phoned my EC, arranged to rejoin AEC, urged early test of 144- and 3.5-Mc. local plan. Visited W. ... Had first taste of work on ... kc.
- **Thurs., 22nd**: Reported into section traffic net, originated first message in 6 months, and also sent one to Hy.
- **Fri., 23rd**: Sent SCM a letter asking for OBS appointment and form for monthly report. Gave Director ... a note reporting our club discussions.
- **Sat., 24th**: Fixed monitor and rechecked rigs for zero splatter and thumps. Got tuned up right for start in Jan. 24th Member Party shindig.
- **Sun., 25th**: Party going big ... lots of activity! Never in contact with so many good operators by radio in one week-end!

**ARRL Party Rules**

To put it simply, this is a family QSO party for all League members, held Saturday afternoon and Sunday. To get contacts, on 'phone simply call “ARRL, this is ... , over,” or on c.w., “ARRL de W. ... K.” Work members, wherever located. The member in each section submitting the leading tabulation will receive an ARRL call-pin award. Advance entry is not required. Use any amateur-assigned frequencies, and part c.w., part voice, or all one mode, as you please.

Two of these ARRL-membership-and-call-letter pins (gold border and lettering, with black-enamel background) will be awarded in each...
section, with call of c.w. and 'phone winners appropriately engraved.

Starting Time: Saturday, January 24th, 3 P.M. PST, 4 P.M. MST, 5 P.M. CST, 6 P.M. EST, or the equivalent time at any point.

Ending Time: Monday, January 26th, 12:01 A.M. PST, 1:01 A.M. MST, 2:01 A.M. CST, 3:01 A.M. EST, or equivalent.

Operate any 20 hours of the 33-hour party. State contest hours you did not operate if your score is over 20,000.

Contest Exchanges

In radiotelephone contacts the section, membership month and year (expiration date) will be exchanged. No special order is required. On c.w., members will abbreviate section names and use four numerals to show membership dates. "CONN 0948" will mean "Connecticut Section, my membership good through March, 1948," for example. Information to be exchanged in every case comes right off your own League membership certificate or pocket card. On logs show frequency bands, 'phone or c.w.

Scoring: One point for each complete set of information sent; 1 point for each set of data received and logged. No member can be worked to get more than one complete exchange for 2 points. A fixed credit of 50 points may be added before multiplier, for those who give earlier date of their ARRL Code Proficiency award ... and for those members attaching Jan. 19th copy, if they qualify.

A fixed credit of 50 points may be added before multiplier, for radio reception and copy of President Bailey's ARRL Week message with the call, frequency and time of transmission of the station from which you received the text.

Multiplier: The multiplier is that number of field-organization sections in which at least one ARRL member is contacted. (Assume W5XXX has completed exchanges with 60 different stations, located in 30 different ARRL sections. His multiplier is 30.) The sum of contact points and either or both fixed credits, if earned, will be multiplied by the number of different sections. A convenient way to keep a record of new sections as you work them is to circle and number the name of the section in your list or mark the list in QST.

Participants report claimed scores with the information on exchanges. Attach a copy of President Bailey's message, if received. Attach CP copy or give date of earlier award for possible credit. Summarize and mail your score promptly.

The fallacy of evaluating antenna radiation through current reading alone is put in disrepute this issue by Assistant Editor Boyd Phelps' excellent article, "Antenna Resistance Measurement." The need for considering the radiation, ohmic, and dielectric-absorption resistances of an antenna is stressed. Another antenna article, "Loop Transmission," by Leon W. Bishop, 1XP, searchingly proposes the use of directional loops to reduce interference to near-by radiophone listeners. Further to meet the severe interference problems which are requiring many of our stations to observe quiet hours, the Editor sounds a call for data on practical power-supply filters to clean up the notes of our self-rectified c.w. rigs. A reprint of S. E. Anderson's Radio Club of America paper, "Vacuum Tube Amplification," discusses in comprehensive fashion the various circuits for coupling audio- and radio-frequency amplifier stages for receivers. Also along this line, Chief Engineer Wm. F. Diehl of Grebe describes his company's new single-stage r.f. amplifier.

25 Years Ago this month

FATHER TIME hardly could have closed his books for 1922 without taking special account of the numerous DX and traffic-handling records that were established at the year's end. As reported in QST for January, 1923, both the Atlantic and Pacific Ocean barriers were decisively toppled. Eighty American and Canadian amateur stations were heard in England alone during the warm-up Transatlantic Preliminaries in November, and latest confirmation is that during the first day of the December Transatlantic Finals two score stations, including the radiophone of Z2K, were heard in England and France. Equally impressive are the lists of calls heard by the radio operators of the S.S. China and S.S. Eastern while making the north and south Pacific runs to China and Australia, respectively. Traffic-wise there is sensational news too: A new high of 50,000 messages was handled by our ARRL stations in November, a highlight of which was the 4-minute 10,000-mile Hartford-Sleepy Eye, Minn.-Hawaii-and-return relay staged by 1AW, 9AWM and 6ZAC.

Here at home amateurs have been in extremely favorable public light. The recent Colorado-Wyoming blizzard saw 7Z0, 9AMB, 9ANQ, 8AB.

(Continued on page 10)
Don't fool yourself for one minute — the trend is toward sharper and sharper i.f. amplifiers. McLaughlin and Rand have both described the advantages of high selectivity in the i.f. amplifier, but it was the surplus market that really came through with a cheap and clean answer. Well, not a complete answer, but at least something that will perk up that old broadband superhet of yours and make it cut through the QRM and pull out the desired signal like nothing you ever saw or heard.

You have probably seen those advertisements for the "ARC-5" or "274-N," complete or in parts. The part we're interested in right now is the receiver that tunes from 190 to 550 kc. Up to a few months ago it was up for sale mainly to the private airplane owners who might be interested in a beacon receiver, but the smart ex-GIs who had worked with the things remembered the specs and latched on to them for another reason. Independently, two different hams (W5KWI, W60ZB) tipped us off. The i.f. amplifier in this particular receiver (designated the BC-453-A by the Signal Corps) works on a frequency of 85 kc. The i.f. transformers have provision for two settings of coupling, the idea being that you align the amplifier with the transformers in the loosely-coupled condition and then increase the coupling to give a broader characteristic. But that sharp position is the one we're interested in! Fig. 1 shows the over-all characteristic of the BC-453-A measured at 455 kc., with all the i.f. transformers loosely coupled. As you can see, the characteristic is even better than that obtained with the "Q5-er," and it's a natural for amateur work.

Adding the BC-453-A to the tail end of your receiver is as painless an operation as you'll encounter in any surplus deal. All you need is 25 volts a.c. at 0.45 amperes, and 250 volts d.c. at about 40 ma. These voltages are fed to the three pins on the top rear of the receiver, where the generator was mounted. The connections are shown in Fig. 2. If you're lucky, you'll be able to scare up a small control panel (designated FT-260-A) that plugs in at the front of the receiver, but we've only seen one of these, and they seem to be hard to come by. However, lacking the control panel, all you have to do is to solder a few wires to the socket pins at the rear of the set, for leads to the audio output, gain control and b.f.o. switch. These connections are also shown in Fig. 2. You can mount the gain control and b.f.o. switch any place you want to, and if you want to keep the unit compact, you can make a small panel for the front, if you can't get an FT-260-A. The proper connections for this panel are also shown in Fig. 2.

The receiver has no a.v.c., but it wouldn't be too difficult to wire it in. However, we haven't found it necessary so far. The b.f.o. adjustment is a screwdriver one on the side of the set, and this is a little inconvenient for single-sideband suppressed-carrier reception, but otherwise the set is a little honey. The workmanship is a beautiful thing to behold. When you get the receiver, unscrew the caps from the i.f. transformers and pull out the fiber pins — they'll move about ¼ inch — to loosen the coupling. The coupling will already be loose on the center i.f. transformer, but tight on the other two. The audio output is...
not too great, but it is certainly adequate to run a small 'speaker.

Now that you have the power and controls to the BC-453-A, all that is left is to tie it in to the receiver. Even this is painless. If your receiver i.f. amplifier uses double-ended tubes, you can wrap an insulated wire around the grid lead to the last i.f. tube, and run the wire out a louver of the receiver. If your receiver uses single-ended tubes, pull out the second-detector tube, wrap an insulated wire once or twice around the diode plate pin, and put the tube back in the socket. Run the wire out a louver. Place the BC-453-A on top or alongside your receiver, connect the wire from the i.f. amplifier to the BC-453-A antenna binding post, and turn on your receivers. Peak a signal on the regular receiver, as indicated by the S-meter, and then tune it in on the BC-453-A. You're all lined up and in business!

Yes, it's as easy as that. Then sit down and have yourself an evening of fun, just getting acquainted with selectivity. One trick is to have a 'speaker going on your regular receiver and one (or headphones) on the output of the 453. Turn off the a.v.c. on your receiver and tune slowly through a 'phone signal — a b.c. station serves nicely. Now tune slowly through the signal. You'll hear it come in on the regular receiver, then come in and go out on the 453, and then go out on the regular receiver! With the a.v.c. on, the effect isn't quite so striking, because the a.v.c. gives a false impression by increasing the signal to the 453 as you tune off resonance in the regular receiver. To use a.v.c. to its full advantage, the control voltage should be taken from the second detector in the 453. But even without making this modification, you'll gain in selectivity by using the 453 as is. The i.f. gain in the 453 should be run at a fairly low level, to avoid blocking in the output, and you can use very loose coupling between the 453 and the i.f. amplifier of the regular receiver.

On c.w. you can use the 453 in several ways. You have the choice of using the b.f.o. in the regular receiver or in the 453 — it doesn't seem to make too much difference. However, you can leave the regular receiver on a.v.c. and use the b.f.o. in the 453, and get readings on c.w. from your regular receiver S-meter. By carefully aligning the tuning of the 453 with respect to your regular receiver's i.f. (with the crystal at its sharpest position), you can get single-signal reception like you have only dreamed of. There is no signal on the other side of zero beat, even with an S8 or S9 signal! By setting the rejection notch of the crystal to take out the last vestige of image signal (the other side of zero beat), you'll have the first perfect single-signal reception you've encountered. And the way you can sneak up to a loud signal and tune in a weak one is wonderful, since the skirt selectivity of the 453 backs up the crystal filter to a fare-thee-well.

We have used 453s made by Aircraft Radio and by Western Electric, and you may have guessed by now that we like them. They are certainly way ahead of your present 465-kc. i.f. amplifier.

--- B. G.

Professor Dan Noble reminded us the other day of a lovely definition which he recalled hearing Hiram Percy Maxim, W1AW, get off at a New England Division convention about 20 years ago:

"A radio amateur is a person who thinks that O. Henry is a coil possessing zero inductance."

"While watching my XYL giving our little girl a home permanent, I found a cheap source of 2-inch open-wire feeder spreaders. The plastic curlers from a 'Toni' home permanent are ready-made spreaders and cost only about 2 cents each. In my case I drilled out the inner holes (which are spaced two inches) and threaded in my feeder wires. The outer forked tongue was used to hold the tie-wires. The XYL says that this ought to put a permanent curl in the standing waves on my feedline ... ouch!" — W6MVX
ELECTION RESULTS

In the six ARRL divisions in which balloting has just occurred for members of the League's Board of Directors, four new directors have been elected for the 1948-49 term and two incumbent directors have been returned to office. Here are the details:

In the Atlantic Division, Walter Bradley Martin, W3QV, the director from 1936 to 1945, was put back into office by a large plurality over four other contestants. The voting:

Commander Martin .................................. 1155 votes
J. Victor Brotherson, W3BHN ..................... 546 "
Edwin S. Van Deusen, W3ECP ..................... 440 "
Robert A. Blackhurn, W3MPO ..................... 391 "
Harry B. Stein, W3CL ................................ 162 "

Commander Martin is on temporary active duty at the Naval Base at Philadelphia, associated with Naval Reserve training. He had many communication billets during the war, most of them in the Pacific, including serving as staff communications officer for the Commander South Pacific. In 1945 he was in charge of Naval communications in North China, his first post-war operating being resumed under the call XU1YV. He has been an active amateur since 1920 and prominent in the affairs of the Atlantic since 1934.

Henry W. Wickenhiser, jr., W3KWA, is the Atlantic's new alternate director, the voting having been:

Mr. Wickenhiser .................................. 1076 votes
G. Edward Keener, W3AJB .......................... 908 "
Don G. Harmer, W3MO ............................. 594 "

"Wick" served as a naval lieutenant during the war and is active as a brigade communications officer in the Naval Reserve now. Well-known ORS, he has been prominent in traffic work since 1933. He is an investment officer of the Fidelity Trust Company at Pittsburgh.

In the Dakota Division, Goodwin L. Dosland, WØTSN, former director of the Central Division, was elected to succeed Dr. George S. Acton, W5BMM, by 363 votes to 163. Mr. Canfield is the senior member of a firm of certified public accountants in Lake Charles, La., and is ORS, OPS and O158. For alternate director the Delta chose James W. Watkins, W4FLS, over Harold E. Walchli, W4TWI, 391 votes to 135. Mr. Watkins, the present Tennessee SCM and president of the Chattanooga Radio Club, is an electrical engineer in the electrical laboratories of the Tennessee Valley Authority.

The Great Lakes Division maintained both the incumbent director and his alternate. Harold C. Bird, W5DPE, nosed out Robert L. Stewart, WSFF, for the directorship, 801 votes to 658. John H. Brabb, W5SPF, carries on as alternate by winning over Chester W. Bolg, W5JXY, 841 votes to 649.

In the Midwest Division, Chester A. Colvin, W9VII, was defeated for re-election by R. Leonard Collett, W9DEA, the latter receiving 537 votes to Mr. Colvin's 464. Wells R. Chapin, W9DUD, although he withdrew his name after the ballots were printed, received 27 votes. Mr. Collett, active on both 'phone and c.w., is a CAA aircraft communicator, with operating watch duties at an airway communication station at Joplin, Mo. He enlisted in the Navy in 1942, was disabled and discharged in 1944. He operates Morse as well as Continental.

As previously reported, the new alternate for the Midwest is Alvin G. Keyes, W9KTQ.

With Director Ladley carrying on in the Pacific Division as the only nominee, that division balloted only for alternate director. In that race, Kenneth E. Hughes, W6CIS, won over Ronald G. Martin, W6ZE, 585 votes to 322. Mr. Hughes, long active in the club life of San Francisco and Sacramento, and with five years service in the Navy during War II, is now an operator at KRG, the San Francisco control station for the eight-station fixed nets of the California State Department of Agriculture.

William G. Shelton, W4ASR, continues in office as director of the Southeastern Division, having won handily over Francis A. Saxon, W4AY, 348 votes to 238. As previously reported, William P. Sides, W4AUP, likewise continues as the Southeastern's alternate.
WASHINGTON NOTES

Something like two dozen additional international radio conferences of various sorts are scheduled for the next two years. While some are only regional and many are of limited agenda, the United States must be represented at a great many of them. The problem is so pressing, with the requirements on time and personnel, that the Government recently called an industry-Government conference in Washington to begin plans; it will require almost a "production line." Fortunately for us amateurs, the only conference of early concern to us will be the Inter-American one to be held in Bogotá in late 1948. Since American proposals must be circulated well in advance, the preparatory work begins in Washington on January 2nd. Thus we are only out of one conference when we begin work on another!

FCC is looking into pseudo-broadcasting by amateurs under the guise of amateur communication. Watch your step! The authorized types of communication are fully set forth in the amateur regulations; you should be familiar with them and abide carefully by them.

If you hear any broadcasting going on in our 7-Mc. band by a broadcasting station in the American Region, please note particulars carefully and advise ARRL Hq.

FCC announces the appointment of Albert L. McIntosh, W3ZM, to succeed Paul D. Miles as chief of its engineering department's Frequency Allocation & Treaty Division and as the FCC representative on IRAC. Captain Miles goes to Geneva as the U.S. designee to IFRB. Mr. McIntosh, who has been assistant chief, served with Captain Miles as a member of the U.S. delegation to the Atlantic City conference, where they were the U.S. spokesmen on frequency matters.

Thus FCC again selects a dyed-in-the-wool amateur for a key post which, by its very nature, requires the scrutiny and solution of problems on an impartial basis. Mac has been a licensed ham since 1929, obtaining his WAC with a Type 210 on 14 Mc. in 1931 from W6CYR. As president of the Hollywood High School Radio Club he operated a 50-watter from W61G in 1929-30. At present he works 14-Mc. c.w. from W3ZM. His ambition is to be one of the openers of the precious new 21-Mc. band.

He attended U.C.L.A. and has done special work in electrical engineering at George Washington University. He has been a member of several United States delegations to foreign conferences. From 1940 through 1945 he served as chief of the identification section of FCC's Radio Intelligence Division. As a Government witness he introduced the plots of d/f bearings and other technical evidence in the famous "AOR" trial which resulted in espionage convictions and sentences of up to 99 years for the members of a ring of German secret agents in New York. Mac has a five-year-old son who regularly wears the cans, to the XYL's horror, and a three-year-old daughter whose jealousy toward the OM's operating time compares favorably with that of the XYL.

THAT 21-MC. BAND

A great many of us are looking forward with much impatience to the opening of the new 21-Mc. amateur band in 1949. The general feeling is that it ought to prove to be a very good amateur band, staying in much longer in the solar cycle and much longer each day than 28 Mc. does and offering considerably more convenient dimensions for rotary beams than 14 Mc. does.

You're all aware that the proposal of this band was laid before the Atlantic City conference by the U.S. Government and that, after considerable sparring with other delegations, particularly that of U.K., it was finally agreed upon with a width of 450 kc. We think you would be interested now in learning how the idea got its birth in the United States. Besides, we want to make bows in the proper direction to put the credit where it is due.

The father of the idea was William R. Foley, W3MQ. Serving in the frequency section of Naval communications for the three years 1943-1945, Lieut. Foley was the Navy's alternate representative on the Interdepartment Radio Advisory Committee, which plotted the Government's needs for frequencies as FCC did for the non-Government services in the joint postwar radio planning which occupied so many years and which finally culminated in the ACy conferences.

It is well known that in time of war, when we are closed down for security reasons, our frequencies are taken over by the military services. The latter, therefore, have particular reason for protecting us and for seeing that any national planning makes adequate provision for the amateur service. In the course of his duties it occurred to Lieut. Foley that the Navy wartime harmonic
families of frequencies would be considerably improved if, in addition to 7 and 14 Mc., there were a third-harmonic assignment at 21 Mc. There just ought to be!

So he proposed it, and it was supported by the other services, and it was adopted, and it appeared in the first IRAC proposal for postwar allocation. Prominent among those who helped to carry the ball, both before and after, was Lient. Comdr. A. L. Budlong, USCGR, W1BUD, then chief of the Coast Guard's frequency section and also serving on IRAC, now again senior assistant ARRL secretary. From that point on the idea gained in strength, was strongly supported by ARRL and was incorporated in the FCC thinking. It was approved by the FCC hearings and was recommended to the Department of State by both IRAC and FCC, and so became a formal part of the U.S. proposals to ACy. The rest of the story you know.

Lient. Foley is now the engineer-in-charge at the FCC primary monitoring station at Kingsville, Texas. He is both an oldtime amateur and oldtime FCC man, having operated WSMQ at Allentown, Pa., and Norfolk, Va., W4FEC at Savannah, Ga., and K4FEC at San Juan, P. R. His previous FCC assignments were radio inspector at Norfolk and Savannah and inspector-in-charge at San Juan. He is also an oldtime Naval Reserve, having organized and commanded Unit 2 at Savannah before War II. He is now awaiting instructions to organize an Electronic Warfare Company at Kingsville. He is the author of several technical articles in QST.

**TELEVISION ARGUMENT**

Oral argument before FCC began on November 17th on the Commission's proposal to end the sharing of television channels by the fixed and mobile services and, instead, to reallocate Channel 1 to the latter services. The argument lasted a week and was participated in by about 200 persons representing about 40 agencies from the several services concerned. ARRL was represented by Technical Director Grammer, General Counsel Segal and Secretary Warner. As previewed in our November editorial, the League urged that Channel 2, rather than Channel 1, be assigned to fixed and mobile, believing that the Commission was overlooking the much more serious problem of harmonics — which, under the Commission's proposal, were likely to deprive TV of a total of two channels instead of one.

The question is now before the Commission for final decision but announcement is not expected in time for this issue. You should watch for it, because it will have an important bearing on the future of our 10- and 6-meter bands. Television is growing rapidly, with much public interest, and an unfortunate allocation decision which precipitates inescapable interference between services in close geographical proximity could cause us increasing headaches. We're sure that members of the League are interested in what ARRL had to say on this matter. We think it important that you be informed on the League's position. Following is the ARRL direct testimony, as presented by Mr. Grammer:

The interest of the American Radio Relay League in the present proceedings arises from the fact that the frequency range under consideration today contains one band allocated to the amateur service and that it also contains the second-harmonic shadow of another amateur band which is currently carrying a greater proportion of all amateur activity than is any other amateur band.

Three other services besides ours are concerned with this portion of the spectrum, namely, television, the fixed service and the land-mobile service. The problems here confronting the Commission are exceptionally difficult. Each of these four services has its legitimate claim to a portion of these frequencies but the available space is palpably inadequate to take care of the needs of all of them. The entire space under consideration is said to be insufficient for the needs of an adequate television service in this part of the spectrum, yet the stated needs of the fixed and mobile services, in extension of their lower frequencies, not only impelled the original decision to employ sharing but now result in the proposed reduction of the television allocation. Yet for television's purposes, this is a most unwholesome portion of the spectrum. It is vile with harmonics from industrial, scientific and medical apparatus, and from numerous services using lower frequencies; most of it is subject to readily-visible interference between services a range under consideration today contains one band allocated to the other one, tele.

We make the point that, that particular die has been cast and that some such provision for television is to be made practical tests and in the range 40 to 88 Mc. are particularly unhappy ones. The sheer truth of the matter is that three of the four services are here in head-on conflict with the other one, television. Those allocations were laid down during the war, when there was no opportunity to make practical tests and when the severity of some of the problems could not be properly appraised. The defects now disclose themselves as the result of practical experience. The severity of the one-channel interference problem now shows that the several other services in this range should not have television for a bedfellow; and it seems now to be amply demonstrated that the fundamental 1945 scheme did not take adequate account of the cumulative susceptibility of television to

(Continued on page 158)
The postwar tendency to abandon tuned feeders in favor of nonresonant lines is a change for the better. These "flat" lines are more convenient to handle and install. If proper termination is preserved, the transfer of power is more efficient. This important question of transmission-line matching has been dealt with in exhaustive detail by a number of sources and will not be considered in this article.

The Micro-Match and its somewhat less precise baby brother, the "twin-lamp," are useful tools in the amateur's hands. They provide a convenient means of quick determination of standing-wave ratio in a line without the laborious and frequently inaccurate methods we previously used.

Vagaries in Micro-Match readings set us off on the study of "parallel standing waves." It came about this way: A number of antennas and their feeders were being measured for SWR. Many Micro-Match readings were taken. Tabulation showed them to be too far wide of the expected theoretical results to enable them to be looked upon as normal measurement errors. Further study showed that if the feeders were disconnected from the Micro-Match and then reconnected the other way around (i.e., the sense of the feeder connections was reversed) two different sets of SWR readings were obtained under the same conditions. Here, obviously, was something decidedly ungood — for a feeder operating properly is symmetrical and the Micro-Match readings should be identical regardless of the way the feeders are connected.

The unbalanced SWR readings pointed directly toward parallel or "antenna" currents on the feeders. Further study confirmed the suspicion. Parallel currents are ones that flow in the same direction on both wires of the feeder as opposed to the normal feeder currents that flow in opposite directions on the two feeder wires. Since the wires of the feeder are spaced but a minute fraction of a wavelength, the parallel currents treat them as if they were a single conductor. Since these currents practically always have a standing-wave pattern, it is convenient and descriptive to refer to them as "parallel standing waves." What causes them? What harm do they do? How can they be effectively eliminated?

Most of us visualize current flow on an antenna-feeder system in rather simple terms. Too often the system itself has entirely different ideas. This article points out several possible ways in which "stray" currents can be set up, tells why they cause trouble, and outlines methods for eliminating them. Attention to this almost completely neglected point will pay off in better antenna performance, lessened BCI, and reduction of harmonic radiation.

How Parallel Standing Waves Are Generated

Fig. 1-A shows a simple dipole fed by a transmission line. This feeder leaves the dipole at right angles. The system is perfectly symmetrical and is inductively coupled to the r.f. power source. If the transmission line is correctly terminated, the currents flowing in the feeder wires are equal and opposite, and there is no unbalance current to produce radiation. The expression "r.f. power source" is used instead of "transmitter," to cover the case where an antenna tuner is used — and it is devoutly hoped that an antenna tuner is used. The ancient and sloppy method of cramming a few turns into the final tank coil is an invitation to BCI, TVI and parallel standing waves. In almost every case it will be found to be an inefficient and ill-matched method of transferring power from the final amplifier to the antenna via the feeder.

Fig. 1-B shows exactly the same antenna system working in a different mode. Here there is capacitive coupling between the end of the feeder and the r.f. power source. For clarity it is considered that no inductive coupling exists. The whole system is going as a flat-top Marconi antenna. The currents flowing through the stray capacitive coupling treat the two wires of the feeder as a single conductor. They rudely ignore our careful work in pruning the dipole to one-half wave and they treat the whole system — the dipole, feeder and even maybe the a.c. power wiring — as one hunk of radiator stuck up in space any old how. In this mode of operation the dimension that must be watched is the one from one end of the dipole, back to its center and then down the feeder to the transmitter or

* Technical Department, ARRL.

January 1948
antenna coupler. That dimension we can measure. We may also get caught by the more obscure electrical length of the a.c. wiring. These points will be examined in detail later.

What harm do these parallel standing waves do? Generating r.f. energy is an expensive business at best. We want to cram all the r.f. energy at our command up the feeders into the dipole and from there into space and out to the ends of the earth. Fig. 1-B shows how parallel currents flow. There is no cancellation and the feeder itself radiates — for after all in this mode it is just, the down-lead part of an ancient “T” antenna. The feeder is vertical and the radiation must be vertically-polarized. The antenna, however, is horizontal and that portion radiates horizontally-polarized waves. Except on some of the u.h.f. bands it is the horizontally-polarized stuff that does business for us. The vertically-polarized stuff is subtracted from our total available r.f. energy. It is also the vertically-polarized field that smears the local BCLs and causes grandmother’s hearing aid to call CQ at her. On top of all that the capacitive-coupled energy is very likely to be rich in harmonics — which state of affairs is most interesting to the gentlemen of the FCC.

What causes parallel standing waves? In Fig. 1-A the sending end of the feeder is inductively coupled to the r.f. power source. The end of the feeder is connected to a small pick-up coil which sits in the field of the associated coil in the r.f. power source. It picks up energy by magnetic coupling and passes it on to the feeder. It is true that the pick-up coil is probably only a turn or two of wire — but don’t forget that the wire is metallic and has physical size. It is close to or wound over the coil to which it is coupled. This coil too is made of metal and has size. Mother Nature says that two conducting bodies adjacent to each other have between them a capacitance (Fig. 1-B) whether they be the two plates of a condenser or our two coils. The capacitance is, of course, quite small but it is still capable of raising bob with our antenna system. We will tag it “stray capacitive coupling” and discuss what to do about it later in this article.

Fig. 1-C shows how we get snarled up. The currents shown are produced by superimposing the normal feeder currents of Fig. 1-B. The two sets of currents add or subtract from each other, as the case may be, and it can be seen that the presence of the parallel currents causes a large resultant unbalanced current.

Supposing you get out O.K. and have no BCI, you might wonder whether it was worth while doing anything about parallel standing waves. Let’s take two of the many ill effects introduced. Where unbalance occurs it is most probable that the performance of the dipole, considered separately from the feeders, is affected and even more probable that the field pattern of the thing will be distorted. In this article we talk about a dipole for the sake of simplicity. The phenomena apply equally to any antenna, beam or otherwise, which is fed with a transmission line. Another example of what we pay for parallel standing waves is common in many ham stations. Consider the ordinary change-over relay. If the line currents are balanced and there are no parallel ones present the field about the feeder is compact. Even the inevitable impedance “bump” caused by the difference in spacing between the two wires of the feeder and the relay contact arms will not have a large enough field about it to couple into surrounding objects. Where there are parallel currents there will be a field about the feeder and probably a strong one. Remember that in this mode the whole system is going like a flat-top Marconi against ground. The relay is right in the field. Its coil and associated wiring appear to the r.f. on the feeder as a short path back to ground — and there goes some more of our hard-earned r.f.!

How To Detect Parallel Standing Waves

How can the presence of parallel standing waves be determined? One method is to take a Micro-Match and, following the normal procedure, read the s.w.r. on the line. Leave everything set and switch off the transmitter. Disconnect the feeder from the Micro-Match and connect it back on but the other way around. Switch the transmitter on again and note the s.w.r. reading. Compare the second reading with the first. If there is a wide difference between the two there are parallel standing waves present on that feeder. If the two readings differ by only a small amount don’t take it for granted that things are O.K. Splice in an added length of feeder — about one-eighth wave — and repeat the test. It may be found that a quite different
The shielded pick-up loop provides a cheap and effective form of Faraday screen, reducing stray capacitive coupling between transmitter and antenna system.

This is a wise precautionary recheck since it is always possible that a single set of readings will present a unique condition in which the discrepancies cancel out.

This is a good place to note that many a perfectly-innocent Micro-Match has been sworn at for telling the truth. If you have used a Micro-Match and got a reading that seemed to you far off the mark, just repeat the test above. It will probably exonerate the instrument and at the same time bring to your attention the fact that all is not well on the feeders.

Where an antenna tuner is in circuit a second method may be employed. Leaving everything set up normally, put a good short-circuit across the end of the feeder and another across the entire antenna-coupling coil. By doing this all inductive coupling is washed out and only stray capacitive coupling remains. Having reduced transmitter power, switch on and then take a sensitive wavemeter and explore with it along the feeder. If there is r.f. present it can only be there by stray coupling, and parallel standing waves are in your hair. A suitable type of sensitive wavemeter is described on pages 397-399 in the 1947 ARRL Handbook.

Cures at the Transmitter End

There are two separate and distinct causes for parallel standing waves and they require separate investigation and cure. One lies in the method of coupling from the transmitter to the sending end of the feeder and the other in the antenna system itself. Let's take the transmitter end first.

The best and surest cure is the use of a Faraday shield. The textbook type is an awkward thing to make and clumsy to install — especially in the push-pull case.

The next best thing is the shielded pick-up loop described in the September '47 issue of QST. Here we have a simple and inexpensive type of Faraday shield within easy reach of anyone. Fig. 2 shows the construction of such a loop. Its Faraday-shield effect can be improved by using the more elaborate arrangement at 2-B. Before describing its construction it would be wise to emphasize the fact that the plastic insulation in coaxial cables has a low melting point. The soldering iron should be used with great care. If the surfaces to be soldered are perfectly clean and the soldering iron well tinned the job can be done with a minimum amount of heat.

Inspection of Fig. 2-B shows that at the base of the loop a gap is provided in the screen of the coaxial cable between X-Y. A single wire is connected at point X. A similar ground wire is connected at point Y on the opposite side of the gap. The inner conductor protruding from the end of the pick-up loop is connected at point Y also. The purpose of the gap is to make it unnecessary for current from the inner conductor at Y to flow back over the outside of the shield to the open end to complete the link circuit.

With either type a single turn only is drawn and wherever possible only a single turn should be used. More turns can be employed if absolutely necessary but should always be kept to the minimum number required for adequate coupling. The size of the coaxial cable is unimportant so long as it is sufficiently robust to carry the output power of the transmitter. This pick-up loop has a high degree of Faraday-shield effect when properly grounded. The ground should be short and direct and made with heavy-gauge copper wire or ribbon. The ground should be connected at the transmitter end only and carried to a point making perfect connection.

Fig. 2 — The shielded pick-up loop provides a cheap and effective form of Faraday screen, reducing stray capacitive coupling between transmitter and antenna system.

Fig. 3 — A Faraday screen blocks capacitive coupling without affecting magnetic coupling. The solid lines depict the magnetic lines of force coupling the two coils. The dotted lines show how the electric field is drained off to ground.
with the transmitter chassis. We get a bonus with the use of the pick-up loop since it also serves to throttle harmonic coupling. This type of coupling can well be used between stages in the transmitter for the same reason.

How does it work? A Faraday shield is a sort of strainer. It permits the magnetic field to pass without attenuation. It intercepts the electric field and drains it off to ground. Fig. 3 shows a simplified diagram of what happens in the case of a textbook Faraday shield. If we put one of these strainers between the transmitter and the antenna coupler we permit inductive coupling and chop off the stray capacitive coupling. But parallel standing waves are caused by capacitive coupling and not inductive coupling. Our strainer thus prevents the generation of parallel standing waves.

Fig. 4 shows the hook-up of the coaxial link between the transmitter and the antenna tuner. The length between the two pick-up loops can be any convenient one but it is good insurance to make sure that it is not a multiple of a quarter wave at the frequency used.

What To Do About the Antenna and Feeder Dimensions?

Our worry is the total length from one end of the dipole back to its center, where the feeder is connected, and down the feeder to its end in the shack. If this length is a half-wave — or a multiple of a half-wave — the impedance appearing at the shack between the end of the feeder and ground is high. Even a very small amount of stray capacitive coupling will transfer an alarming amount of r.f. to the feeders and set up parallel currents.

If, on the other hand, the length is an odd number of quarter waves the small stray capacitance will transfer little energy or none at all. At first glance that looks fine — but let's see what happens at harmonic frequencies. If the length is a quarter wave at the fundamental frequency it will be a half-wave, a number of half-waves or even full waves at a harmonic frequency. At these frequencies the end of the feeder will look like a high impedance and the stray capacitive coupling will do the rest — even more than on the fundamental, since the harmonics are at a higher frequency and more energy will be transferred through a given amount of capacitance.

The answer is to compromise and cut the over-all length, from one end of the dipole through to the end of the feeder, so that it comes out at a dimension between a multiple of one-quarter and an odd multiple of one-eighth wave. Let us restate that this is a compromise and not a complete cure. It will, however, cool off the r.f. in the shack — by preventing a voltage loop (in the parallel mode) from appearing at the transmitter.

The Importance of Antenna Symmetry

As if things weren't complicated enough already, we must consider another cause of parallel currents. Fig. 5-A shows a dipole from which the feeder hangs at right angles. The dipole is horizontal and parallel to ground. We then have a system that is symmetrical both in itself and with respect to ground. By their position in space, both wires of the feeder are equally exposed to the fields of both halves of the dipole. Some of the radiated energy from each half of the dipole must be picked up by each feeder wire. Thus currents are induced — but these currents are equal and opposite in each feeder wire because the system is perfectly symmetrical. Since they are of equal magnitude and 180° out of phase they will cancel each other out.

In Fig. 5-B the feeder is shown coming away from the dipole at an acute angle. In this case the field from the right-hand end of the dipole will induce more current in the feeder wires than the field from the left-hand end. These induced currents will never completely cancel and there will be an unbalanced current, i.e. a parallel standing wave.

We must achieve symmetry at all costs, or at least as much symmetry as our particular set-up will permit. Even if it is necessary to increase the total length of the feeder proper it should be so arranged that it departs from the antenna at right angles for at least one-half wavelength at the fundamental frequency. Lengths shorter than a half-wave are an invitation to trouble.

Fig. 5 — A—The ideal position of the feeder in respect to the antenna. The farther the 90° portion can be extended the better. B—A feeder coming away from the dipole at a sharp angle is looking for trouble in the form of unbalance and parallel currents. To be avoided if at all possible.
Let us now take careful aim and slowly squeeze the trigger in order to blast a commonly-held amateur superstition. It is widely believed that the existence of large standing waves on a feeder automatically means that the feeder is radiating. Regardless of the magnitude of the standing waves, as long as the currents are equal and opposite and there is no unbalance current present, there will be no appreciable radiation from the feeders. As an illustration, let’s look at two types of commonly-used antennas fed with tuned lines.

One type is the center-fed dipole (commonly and incorrectly named a “center-fed Zepp”). Assume that we have satisfied the conditions of symmetry and the system looks like Fig. 5-A, except that the feeders are tuned. As has been detailed above, all currents induced on the feeder by the two halves of the dipole are equal and opposite. Unless there is some outside influence causing a parallel current and hence an unbalance in the system the currents cancel each other out and radiation from the feeder does not take place.

The old stand-by Zeppelin antenna, on the other hand, almost inescapably has a radiating feeder. It is true that by a rather complex technique the feeder currents can be balanced but since it can take place at only one frequency at one time it is not applicable to amateur uses and will not be considered.

Fig. 6 shows the Zeppelin antenna. The feeder currents put into the tuned line by the transmitter are equal and opposite as they flow on the feeder wires. The left-hand wire of the feeder pair is connected at its end (point B) to the end of the radiating dipole (B-O). There is, however, the length A-B-C which, aside from the feeder duty that part A-B does, is still a piece of wire and constitutes, by itself, an antenna. In the “antenna” A-B-C there is also a current flowing in the same fashion as if it were a simple “L” antenna. This current superimposed upon the normal feeder currents causes an unbalance current and the feeder radiates.

**Maybe the Power Wiring Needs Treatment Too**

So far we have looked into the antenna coupler and the antenna-plus-feeder system. That leaves the a.c. power wiring. It may be perfectly innocent but it is better to check and make sure. Many amateur stations are in attics or on the upper floors of buildings. The power wiring has to get there from the house meter, which is usually located in the cellar. One side of the power wiring is often said to be “grounded” — but that doesn’t necessarily mean an r.f. ground. Although we can’t see it, there is all this power wiring hanging between the transmitter and ground. From an r.f. standpoint the transmitter is floating high in the air (so are the receiver and the station generally). It can happen that the power wiring either by itself or as part of a flat-top Marconi system, starting with the dipole, is of a resonant length and will absorb power and thus set up parallel currents. Whether this is going on can be checked by taking a sensitive wavemeter and exploring the power wiring all over the house and right down to the house meter. If there is r.f. present on the power wiring it will be detected by the sensitive wavemeter. By-pass condensers, from each side of the a.c. line where it enters the chassis, to a good ground point, may do a lot of good. If the condition is really severe a simple line trap as shown in Fig. 7 will help. The line trap is connected between a point close to the transmitter chassis and the a.c. power source. To adjust it, simply switch on the transmitter and place a sensitive wavemeter close to the lead from the line trap to the power source. If the meter shows a reading, tune the condenser in the line trap until a minimum reading is obtained and leave it set. Unfortunately this type of trap is effective on one band only, and its usefulness is thereby limited. It will, however, prevent r.f. from leaking back down the power system until it gets into somebody’s a.c.-d.c. or TV set. More important, in those cases where the power wiring has associated itself with the antenna system to become a flat-top Marconi, the insertion of the line trap de-

[Continued on page 146]

January 1948 49
A MILATERS all over the world are invited to take part in this contest, designed to bring out more DX for all DX workers. Operators outside the continental U.S. and Canada will try to work as many of our stations as possible to exchange serial numbers. Stations in all localities need only take part and report results to receive credit and to be eligible for the medalion awards. Individual competition in this activity is only with other operators in your section, so one does not compete, strictly speaking, with operators across the nation.

A quota plan for mainland United States and Canadian contestants of three stations per country applies only in the c.w. contest. You may enter one or both contests, since c.w. scores are independent of voice scores. All claimed points in the 'phone section of the contest must be made voice-to-voice. In the telegraph contest only c.w.-c.w. QSOs count. Contacts with operators who don’t submit logs can count if proper exchanges are made. Refer to this announcement to explain the plan of operations.

Operators exchange two- or three-figure signal reports¹ combined with three self-assigned numbers. Each operator allot himself three figures to form the last portion of the serial number that he sends to stations contacted. Complete exchanges are recorded in the contest log, as shown in the example.

In 'phone exchanges two numerals will be given, the first the “readability” and the second the “strength.” C.w. exchanges should also include accurate tone-scale reports. Thus telegraph entrants will send and receive six-figure groups, and 'phone entrants five-figure groups.

**Awards**

Engraved medallions will be awarded c.w. and 'phone-operator winners for each country, and leaders in each U.S. A. and Canadian ARRL section.² *Separate QST listings will credit the results of stations where more than one operator participated in any contest work. Additionaly, the collective scores reported by club secretaries and confirmed by receipt at ARRL of individual contest logs, will be considered for a club listing where at least three 'phone or three c.w. entries validate the minimum showing required to constitute a club entry. ARRL will present a gavel to the club submitting the greatest aggregate score.*

**Rules & Conditions**

1) Contest logs must be marked “'phone” or “c.w.” Separate entries may be made for c.w. and 'phone.

2) The ARRL Countries List (not prefixes) shall define remote localities and, in the mainland United States and Canada, the government licensing areas (such as W1, W2, V88, etc.) similarly shall be used to determine the multipliers for the scores of the DX stations.

3) Scoring: Both the continental United States or Canadian station, and the station in the remote locality, receive one point when a serial number is acknowledged by the station in the remote locality. Each operator adds two points more when a serial number to U.S.A./Canada is acknowledged.

Quotas. There is no quota limit on the number of continental U.S. A. and Canadian stations that “outside” stations may work for credit. W/VEs: On c.w., the quota is three stations per country per band. (If one-way exchanges for less

---

¹ Communications Manager, ARRL.

² For RST definitions of “readability, strength and tone,” see 1948 ARRL Handbook, or Operating on Amateur Radio Station, page 15.

³ Alaska, Hawaii, Philippine Islands, Cuba, Puerto Rico, Canal Zone, Newfoundland, and all localities outside the continental United States and Canada will receive QST mention and awards based on their work with W/VE stations.

⁴ Page 6 of this issue carries a complete list of sections of the ARRL field organization.

⁵ “Countries” for U.S.A.-Canada; “districts” or “licensing areas” for others. A progressive record of new countries (or licensing areas) is kept in these columns. The multiplier for “each band” is added to obtain the over-all multiplier. The Worked Record shows the progressively-increasing new countries (or licensing areas) in each band as the contest proceeds. The last number in each column added to similar numbers in the other columns gives the over-all multiplier. Counting the entries in the columns gives the different contacts on each band for the log heading.

⁶ February 12th (and March 12th), one minute past midnight, Saturday morning, Greenwich, marks the start of c.w. contest periods. This is Friday night Feb. 12th (and March 11th) 6:01 P.M. MST, 90th meridian time; 7:01 P.M. EST, 70th meridian time; 6:01 P.M. CST, 80th meridian time; 5:01 P.M. MST, 105th meridian time; 4:01 P.M. PST, 120th meridian time, etc. Time at other points should be computed from Greenwich.

The c.w. periods and one minute before midnight, Sunday night, Greenwich (7:59 P.M. AST, 8:59 P.M. EST, 5:59 P.M. CST, etc.) making each operating session two minutes short of 48 hours long.

The 'phone periods start Feb. 20th (and March 19th), hours as above, ending also one minute before midnight of each following Sunday night.
LOG, 14TH A.R.R.L. INTERNATIONAL DX COMPETITION

Example: W6ZAA, Serial No. 543)

C.W. Entry Feb. 13th-15th

(Logs from W or VE show, for each band)

<table>
<thead>
<tr>
<th>Bands</th>
<th>3.5 Mc</th>
<th>7 Mc</th>
<th>14 Mc</th>
<th>27 Mc</th>
<th>28 Mc</th>
<th>Total</th>
<th>Different Stations &amp; Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nr. DX Stations QSOed</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nr. Countries QSOed</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No. Hours Station Operation (17 h. 28 min.)

ARRL Section (for continental U.S. and Canada)

<table>
<thead>
<tr>
<th>Date &amp; Time</th>
<th>Station Worked</th>
<th>Country</th>
<th>Worked Record of New Countries &amp; for Each Freq. Band</th>
<th>Serial Numbers</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb. 13th</td>
<td>VP9E</td>
<td>Bermuda</td>
<td>3.5 7 14 27 28 50 Sent Received</td>
<td>583543 479001 3</td>
<td></td>
</tr>
<tr>
<td>4:02 P.M. PST (or 0002 GT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb. 14th</td>
<td>G2M1</td>
<td>England</td>
<td>3 5 7 9 20 24 Sent Received</td>
<td>488543 488111 3</td>
<td></td>
</tr>
<tr>
<td>8:15 P.M. PST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mar. 12th</td>
<td>G8AZ</td>
<td>Netherlands</td>
<td>2 4 6 8 10 12 Sent Received</td>
<td>399543 599287 3</td>
<td></td>
</tr>
<tr>
<td>12:05 P.M. PST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mar. 13th</td>
<td>VK2T1</td>
<td>Aust.</td>
<td>1 2 3 4 5 6 Sent Received</td>
<td>588543 579000 3</td>
<td></td>
</tr>
<tr>
<td>12:05 A.M. PST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan. 14th</td>
<td>PY2AC</td>
<td>Brasil</td>
<td>4 1 3 5 7 9 Sent Received</td>
<td>487543 489852 2</td>
<td></td>
</tr>
<tr>
<td>4:30 P.M. PST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Multiplier = 2 + 4 + 1

24 x 7 (countries) = 168

I certify, on my honor, that I have observed all competition rules as well as all regulations established for amateur radio in my country and that my report is correct and true to the best of my belief.

Operator's Signature

January 1948

than the three points per station have been made, an additional station may be worked to give not more than nine points per country, per band.) On "phone, there is no quota limit on the stations per country. The same station may be worked again in other bands.

Multipliers: The number of countries worked on one band plus those worked on a second band, etc., shall be used as a multiplier.

All others: The number of continental U.S.A. and Canadian licensing areas contacted (a possible eighteen) shall be used as a multiplier of the sum of all claimed QSO points for the total score. This multiplier is increased further by working the same areas on additional frequency bands. (Eg.: Ten, eight, and five areas, indicated by call numeral, are worked on three bands. The sum, twenty-three licensing areas, is the multiplier.)

The final score equals the total "points" multiplied by the "multiplier."

wich. Phone — start Feb. 20th (and Mar. 19th)
0001 or 12:01 A.M. Greenwich. End Feb. 21st
(and Mar. 20th) 2359 or 11:59 P.M. Greenwich.

All work in a designated mode must take place in
the proper period.

5) Logs must include date, time of QSO, call
of station worked, serial numbers exchanged,
total time and other data as shown on sample
log, with the claimed score.

6) Eligibility: Fixed amateur stations in any
part of the world are eligible to participate. Only
single-operator stations will compete for medal­
ion awards. More-than-one-operator stations
will be given special mention, in the order of
their scores. No credit will be granted for ex­
changes with ship-expedition or aero- or maritim­
mobile stations. All claims presented must relate
to operation in one country or ARRL section.
Crossband work may not be counted.

7) Declarations: Each entry must include the
signed statement as shown with the log example
and, in addition, the names or calls of persons
who assisted in any manner, by spotting stations,
keeping log, or by using key or microphone
during the contest periods.

8) The entries will be passed upon by an
ARRL award committee whose decision will be
final in all cases. No correspondence can be
entered into regarding Contest Committee deci­
sions. Crossband work may not be counted.

9) Disqualifications: The award committee
will void or adjust claims as their interpretation
of these rules and the evidence available may
require. Off-frequency operation (as confirmed
by single FCC citation or advisory notice or two
accredited official observer measurements) will
disqualify. Written protests concerning alleged
 unethical contest operating practices may be
submitted by participants. Such complaints
when from independent sources and buttressed
by specific and adequate evidence will be con­
sidered by the committee in determining dis­
qualification of the offenders. Low tone reports in
logs also will be disqualifying.

Operating Tips

Much listening is recommended — you have to
hear them before you can work them. Full break­
in makes for highest operating efficiency.

U.S. and Canadian amateurs: Many remote
stations will not answer VFO calls on their exact
frequency. Avoid any use of CQ. If ten fellows
were calling you, would you look for and answer
someone calling CQ?

All others: Short CQs will bring you many
calls. Sign often to get your call through QRM.
You can make your own operating pleasant by
not answering any U.S.-Canadian station who
uses your exact frequency. Make North American
hams spread out both in this activity and at all
times by refusing to answer if they use your exact
frequency. Use the following signals after your CQ
and reward those who do your bidding:

HM — Will start to listen at high-frequency end of band
and tune toward middle of band.
MH — Will start to listen in the middle of the band and
tune toward the high-frequency end.
LM — Will start to listen at low-frequency end of band and
tune toward middle of band.
ML — Will start to listen in the middle of the band and
tune toward the low-frequency end.

Invitation

Follow the sample report and take part! No
advance entry is required. Your own copy of our
form will be accepted. However, for your con­
venience ARRL has made up a mimeographed
contest form or work sheet for your use in the '4S-
Competition. A postal card or radiogram will
bring you three forms by third-class mail at no
cost to you. Send postage if you wish us to use
first-class or air mail.

Here are two week-ends dedicated to radio­
telephone DX and two for c.w. DXing. Plan to
make the best of them and see what you can do
in the contest periods. Even those who don't ex­
pect to win for their area can add some choice
countries, and hams in other nations will get a
 crack at some of our hard-to-get states.

Silent Keys

I t is with deep regret that we record the
passing of these amateurs:

W2BTO, Arthur L. Kent, Binghamton,
N.Y.
W2GHZ, Carl F. Mueller, Elizabeth, N. J.
Mrs. Henry W. Yahnel (XYL of W2SN),
Assistant Manager W2 QSL Bureau,
Helmetta, N. J.
W6TZQ, Curtis L. Dunwoody, San Leand­
ro, Calif.
W8DTS, Albert A. Gloor, North Canton,
Ohio
W8OEY, Jesse P. Braey, Bluffton, Ohio
K9AAF, Lee W. Elliott, Appleton, Wis.
W9PRK, Wilbur F. Reed, Marshfield,
Wisc.
W9WEU, Victor 0. Christian, Gary,
Indiana
W9YKJ, Wynne H. Davies, Chicago, Ill.
G6PM, Peter Modridge, Edgemoor, Mid­
dlessex
GM5YG, Jack Wylie, Glasgow
GM5KQ, James Fraser, Crieff, Perthshire
HC2HP, Dr. Herman B. Parker, Guaya­
quill
XZ2EM, L.t. Col. R. M. Hall, Rangoon
ZL1DD, Edward B. Foster, Auckland

52 QST for
ILLUSTRATED this month is the new Naval Reserve Radio Station certificate which is being issued to amateurs who are members of the Reserve. The certificate assigns an official Naval Reserve call to be used on Naval frequencies during emergencies and radio drill periods. Reservists are also authorized to use the Reserve emblem on their personal amateur station QSL cards.

The following Naval Reserve amateur calls have been issued since publication of last month's list:

K1NRL Lowell, Mass.  K6NRD Santa Clara, Cal.
K2NAA Brooklyn, N. Y.  K6NRM Modesto, Cal.
K2NRV Passaic, N. J.  K6NRX Santa Rosa, Cal.
K4NAA Covington, Ky.  K7USN Portland, Oregon
KANAB Kingsport, Tenn.  K7NBO Bremerton, Washington
K4NAC Miami, Fla.  K5NR San Antonio, Tex.
K5NR San Antonio, Tex.  K8NAA Hamilton, Ohio
K5NRT Jackson, Miss.  K7NAA Joliet, Ill.
K5NRT Jackson, Miss.  K8NAC Emporia, Kansas
K6USN San Francisco, Cal.  K8NRA Lambert Field, St. Louis, Mo.
K0NAB Oakland, Cal.

During the biggest ham get-together of all time — the 10th Annual Boston Hamfest combined with the ARRL New England Division Convention — a Naval Reserve mobile radio station was set up in Mechanics Hall and numerous stations worked using the amateur call K1USN/1. Admiral Deyo, commandant First Naval District, addressed the 4700 amateurs in attendance and congratulated them on their achievements. Reservists in charge of the USNR booth included W1s FGC, FL, LLQ, Jv, NK and QIE.

E. W. Officers Division 3-1, New York City, conducted its second meeting on 20 November. Several hundred Reserve electronics and communications officers heard Captain D. R. Hull, assistant chief of BuShips (Electronics), speak on "The Technical Phases of Electronic Warfare." Captain Hull is ex-lCBU.

E. W. Company 3-23 at the Grumman Aircraft plant, Bethpage, L. I., N. Y., dedicated its Naval Reserve radio station, N3CAW, on Navy Day. Admiral Grover C. Klein was the principal speaker, and an aerial exhibition by Grumman's latest plane, the Bearcat (F8F), was a highlight of the ceremonies.

Marine Corps Electronic-Warfare Plans Formulated

Approximately 500 radio amateurs served their country well in the U. S. Marine Corps during World War II, and with the inauguration of the new Reserve Electronic Warfare Program the Corps once again looks to the amateur fraternity as a source of much-needed electronics and communications specialists.

Organization of the Program calls for Electronic Warfare Units specializing in missile guidance, radar, pilotless aircraft, atomic weapons, TV, etc., each composed of one officer and nine enlisted men. Special Technical Units are also being formed, consisting of ten officers whose education and experience qualify them at the research, design and production engineering levels in the electronics field. A full training program has been evolved for Reservists, including access to the specialized courses of the Marine Corps Institute.

Amateurs desiring further information on the Program should contact the nearest Reserve activity, or write to Electronic Warfare, Division of Reserve, Marine Corps Headquarters, Washington 25, D. C.
New England Amateurs Aid in Forest-Fire Emergency

'Phone and C.W. Nets Exemplify Fine Organization

New England felt itself fortunate during September and early October. The weather was just what the late fall vacationers wanted. No appreciable rain had fallen since the first week in September, and here it was, the middle of October. True, some thoughtful persons were beginning to become alarmed about the overdry conditions in most of the wooded areas, but there seemed little need for concern, particularly when the unprecedented "run" of clear weather was bringing out a prodigal number of postseason vacationers who had money to spend in the resort areas of northern New England.

The first warning, during early October, of the trouble which was to come was the action by the Governor of Maine in declaring the wooded areas "out of bounds" to hunters and vacationers lest careless persons cause the starting of fires. This action was followed within a few days by similar proclamations by the Governors of the other New England states.

It seemed that the forty days and nights of clear skies were not an unmixed blessing. And then it began — at first only a number of small fires, but soon, as we know now, hundreds of acres of valuable timberland were to be devastated.

Maine

Kennebunkport, a resort and fishing town on the Maine coast, about 30 miles south of Portland, was one of the first communities to be ravaged by a major blaze. On October 21st, W1OHY, Portland EC, received a request from Mr. Douglas K. Hammett, chairman of the Emergency Committee, Portland district, American Red Cross, for the establishment of communications between Portland and Kennebunkport, all wire lines between those cities having been burned out. Immediate contact was effected with W1KJJ in Kennebunk, some 7 miles west of Kennebunkport. W1KJJ reported that he had contact with Kennebunkport via landline at that time, but that the wires between Kennebunk and Kennebunkport were expected to be burned out momentarily. W1LN1, Maine SEC, Portland, was pressed into service to handle the Portland end of the circuit to Kennebunk and W1OHY and W1LZI departed for Kennebunk with 144-Mc. equipment to cover the link to Kennebunkport when, and if, the line burned out. Vince Carr assisted in the operation of W1LN1 during the night.

Early the following morning three more mobile units were dispatched into the fire area. Both 28-Mc. and 144-Mc. outfits were taken by W1FBJ, W1MBR and W1MXQ.

The State Police relay station having been burned out at Waterboro, one unit under W1MXQ filled in the link from W1LZI to W1OHY who was at the Central Fire Station in Kennebunk. Stations were set up in South Waterboro and Waterboro Center to facilitate communications between Chief Werrin and his deputies.

Fires at Bar Harbor had by this time reached serious proportions. W1LN1 was requested by the Associated Press to get traffic out of that vicinity. Contact was made with W1DAS, Ellsworth, W1AUC, Trenton, and W1A1, Millbridge.

A mobile unit operated by W1PGZ and furnished by K1NRC, local Naval Reserve, was sent to Kezar Falls and then to Sanford. Many welfare messages were passed from one station to another, depending on the geographical locations involved.

Saturday morning, two mobile units under W1MBR and W1PYD were alerted to work with two airborne units manned by W1VV and W1EFR, who went up over the fire areas. Because of heavy smoke and high winds, accurate observations were impossible for fire spotting and the planes were at stand-by the rest of the day and Sunday.

On Saturday morning, W1FBJ, NC of the Sea Gull Net, moved his station to the Red Cross headquarters in Portland, and W1LN1 assumed

Russell H. Lowd, W1LN1, Maine SEC, at the 300-watt transmitter where he acted as NCS of the Sea Gull Net for the duration of the Maine fire emergency.

QST for
control of the net for the duration. This move released WIFBJ for direct contact and processing of priority traffic to the Red Cross and other officials.

WIQIA, of the University of Maine Annex, Brunswick, Maine, operated by WIQIQ, W1NWJ, W10MK, Clifford C. Little and Frederick B. Olsen, was sent to Hollis Center, a very hot spot. They remained there until midnight, Sunday; then packed and returned to school at Brunswick.

Through the courtesy of Lt. Cmdr. R. B. Coleman, director of Naval Reserve communications, First Naval District, and Lt. (jg) Frederick B. Olsen, CO of Naval Reserve Electronic Warfare, a TCS-14 was made available.

Localities served by this mobile unit were Clark's Mills and Richmond.

W1DEO was dispatched to Biddeford Red Cross headquarters to relieve the pressure at that point.

W1FBJ/1 was installed at Red Cross headquarters with the help of W1PYD, W1OIS, W1FBJ, W10HY, Frank Skillin, Wayne Rietta, Irvin Cox, Ray Rollins, and Gerald Cole, a Red Cross official. The Lucas Tree Experts supplied a crew to hang the antenna. The station went on the air with W1FBJ and W10HY as operators and Rietta and Rollins as traffic men. Other operators and assistants who helped maintain twenty-four-hour operation were W1LOA, W1EWN, W1CRU, W1MRB, W1ATO, W1EIY, W1LIZ and W1PIX.

The control station, W1LNI, was also maintained on a continuous-watch basis with operators and assistants as follows: W1LNI, W1V, W1FXA, W1FO, W1MNR, W1MFK, W1CRP, W1LHD, W1ODA, W1GVS and Vince Carr. W1LNI's XYL did a magnificent job in supplying all hands with hot food and drinks at unheard-of hours.

The light cruiser U.S.S. Little Rock sent two portable units out into the field where they were most needed. Unit NBVW/1 went into action at Clark's Mills, while NBVW/2 took station at Kezar Falls. NBVW/2 later moved to Norton Hill, West Brownfield. These units remained in operation, except for time out to charge batteries, until Wednesday noon at which time rain made it unnecessary for further operations. NBVW and field stations worked on 3960 kc. with the Sea Gull Net, using power of three watts.

W1APQ, of Hampstead, N. H., and W1CCF moved to Kezar Falls where W1APQ set up and W1CCF went on to Hiram. These units remained in continuous operation for several days. Both operators managed to get some sleep during the quiet hours. W1DEO covered at Biddeford when W1PLB moved back to his home location at Saco. After W1PLB was in operation, W1DEO was sent to Limerick, and operated there until released at 10:00 P.M. Sunday.

Station W1FBJ continued twenty-four-hour operation until 11:30 P.M. on October 25th, at which time it was considered safe to shut down until the next morning. Conditions made it necessary to continue through to Wednesday, October 29th, at which time the station was taken off the air because of increasingly-favorable weather conditions. Beginning Wednesday morning, no further attempt was made to keep the circuit clear, as commercial lines were able to supply communications and the situation was well in hand. W1FBJ kept in close contact with the Red Cross during Thursday but no more operations were considered necessary and preparations were made to return the equipment to the home station.

At Boothbay, amateurs of the vicinity pooled equipment and stood by for possible assignment. One station, W1KMM, was the net contact. W1KRR set up his Mark II transmitter and receiver near the Red Cross and telephone connections. Batteries were loaned by a machine shop and a gas generator was made available. The following amateurs stood by until released: W1KMM, W1KRR, W1LUK, W1NII.

A group from W1YA, University of Maine, established communication between Somesville and various groups of fire fighters which were working out of that community in an attempt to prevent the devastation of the town by a number of fires which were blazing through the surrounding countryside. The group from W1YA included the following: W1s GKU, KNQ, KYO, MLB, MZK and OKU.

W1GMD, at Topsham, contacted the Univer-

January 1948
at the University of Maine, Bowdoin College, and the Red Cross, and assisted in many ways. W1PYD went to Portland to help W1FBJ.

In the Ellsworth-Trenton-Bar Harbor region W1AFT stood by for 46 hours and handled 12 messages. W1AI worked with men from WABI of Bangor and passed traffic for their use which was broadcast. Relays from NBVW /1 and /2 were made to W1LN1 and W1FBJ. W1DAS stood a lone trick for a total of 90 hours operation with 40 messages handled. W1AMR was consistently on the Sea Gull Net, relaying traffic and covering for his teammates whenever called.

In the Saco area, W1PLB moved his rig to Biddeford and joined the Net. He was assisted by W1PYD, W1GKJ and W1NXX. After the Coast Guard and other units arrived, W1PLB was moved back to Saco and operated from there for the rest of the emergency.

An emergency c.w. net was set up and controlled for the duration of the Maine emergency by W1GVS, and included Wls AKR, AMR, AWQ, BPX, CPL, DAS, EFR, FO, GE, HSW, ICN, JAS, LBJ, LDC, LKP, LPS, LRQ, LWO, MQB, NXX, OAC, OHT, OHU, OTM, PVY and QGU. This net served to provide general message coverage into the Maine area for traffic coming from outside points, and helped to keep the 'phone net free for use as a Red Cross facility.

Massachusetts

The Fitchburg, Mass. Park Department called upon the Fitchburg Radio Club to provide communications assistance to the fire fighters who were battling a number of fires near that city. Both 144-Mc. voice stations and 3.5-Mc. c.w. stations were provided and manned by Wls ACP, CCK, EAX, EIR, JYA, LXT, MBL, MIM, MSV, MVF, OBU, OLD, OME, OY, PQW, PTO, QC, QEX and QKX.

In Pittsfield, Mass., the American Red Cross Disaster Relief Committee called upon the Pittsfield Radio Club to furnish communications in connection with a fire raging in that area. W1LUD, EC, called out the AEC group, and using 144 Mc., 3.5 Mc., and 3.85 Mc., the gang included Wls ACP, CCK, EAX, EIR, JYA, LXT, MBL, MIM, MSV, MVF, OBU, OLD, OME, OY, PQW, PTO, QC, QEX and QKX.

The Merrimack Valley Amateur Radio Club, of Lawrence, Mass., including Wls BLO, CP, CRW, G0, IGO, JDK, LBH, MCD, MQN, NNG, NON, NZS, PFA, QGH, QIT and QNC, operated a net which relayed fire reports from a plane spotting fires in the areas near Exeter, N. H., and Rockport, Mass.

The following amateurs outside the immediate emergency areas are among those known to have contributed to the success of the operations: Wls AHP, ATS, AW, AWN, AWT, BUZ, CK, CMQ, CZ, DAV, EFW, EUL, GDE, GMH, GPJ, HKP, ICO, IGW, INW, ISH, JCK, JRS, KKJ, KOB, KTT, KYG, LKP, MGP, MGR, MP, MVD, MXT, NNG, OCD, OE, OGU, OQI, PTL, PYM, QC, QDO, QEU, SS, TE, TO, UP; and W2s AFX, PDP, QBS and SOU.

—A. H.

Phone-Band Phunnies

The "Ain't-I-the-One" Boy

This is the personality kid. He is simply oozing the stuff at every pore and practically knocks himself out every QSO being witty, humorous and wise all at the same time. He is really loaded with a collection of Reader's Digest bottom-of-the-page anecdotes, and he trots them out at the slightest provocation.

He insists on being "different," even in calling CQ, and he often calls in a foreign language to prove his erudition, or throws in little humorous "asides" while he is calling. Once in contact, he affects a fine scorn for the ordinary routine of giving signal reports, weather, etc.; he is likely to ask abruptly, "Can you tell me what is the price of hay in China? Over."

Another of his pet performances is to "invent" some Rube Goldberg type of thing and explain its working in great detail every time he has a QSO. Some form of "smellovision" is a musty favorite in this respect.

All of his transmissions are obviously made with his BCLs strongly in mind, and he waxes quite histrionic at times — so much so that it is a little difficult to tell which kind of a ham he is, whether the sock-and-buskin or the key-and-nickel genus.

It is seldom indeed that you can tune any of the amateur bands without finding at least one splendid specimen of this poor man's Jack Benny.

—John T. Frye, W9EGV
CONDUCTED BY E. P. TILTON,* WIHDQ

Considering the nature of the reports at hand this month as the first sheet goes into the typewriter, this department might well start off with the familiar "How; What; Where;" of its neighbor a few pages away, for the news of the moment on 50 Mc. is certainly concerned primarily with the query, "How's DX?" In fact, we venture to say that, if it were possible to analyze all QSOs that took place on all amateur bands during the month of November, 1947, the 50-Mc. band would show the highest percentage of international DX QSOs of any of our slices of the spectrum! And a large portion of those contacts which were not international were at least transcontinental in character.

Such was the generosity of the ionospheric Santa Claus. How long it will continue is anybody's guess, but present indications are that there may be some 50-Mc. DX worked during the peak periods each month through the winter, with a resumption of north-south work, at least, in the February-March period, as in 1947. It is probable that the 50-Mc. enthusiast will have found an appreciable amount of DX in his Christmas stocking by the time this appears in print, as the holiday period last year showed several days of m.u.f. very close to 50 Mc., and this year has thus far run well above last, period for period.

Where DX was worked during November was principally a matter of the distribution of activity over the world and the alertness of the operators on the band, as DX contacts were made almost everywhere where there were sharp operators looking for it. Almost everywhere, too, the boys were counting countries, and a 50-Mc. WAC appeared to be within the realm of possibility. At least one American, W5VY, San Antonio, Texas, had North and South America, Europe, and Oceania already in the bag! Various European stations, now hearing commercial harmonics in the 50-Mc. region from the Near East, India and South America, are certainly not very far behind.

It is utterly impossible to record in day-by-day form all the DX contacts made in November, but some highlights are in order. On the first day of the month, after a quiet morning (the first day when Europeans were not worked for more than a week), there was a terrific east-west opening. There had been brief sessions of transcontinental DX before this, but never anything like the furor of this afternoon. W1, 2, 3 and 4 worked W6, W7 and VE7 in a four-hour riot. A new prefix appeared on the scene, too, as KL7DY, Sitka, Alaska, had the gang in W2, 3, 4, 5, 8, 9 and 0 lined up waiting to work him. The W1s were waiting in line, too, but none of them made it — a significant fact, indicating that the great-circle path from W1 to KL7 was just over the northern edge of that elliptical area of high m.u.f. lying along Latitude 50. We worked along the high m.u.f. area (W1-W7, -VE7); we worked across it in criss-cross fashion (W1-W6; W4-W7, -VE7; W2-KL7, etc.); and we worked almost straight across it (W5-KL7); but we have no evidence that there was anything not visible on the predictions, such as a W4-XE, or a W1-KL7, though the latter might have happened if nobody else had been on the band, as W1s heard KL7DY, but weakly.

The following day was similar, except for a slight deterioration in the transcontinental characteristics and a reopening of the European path. This day was fair — W6OVK was able to make 52 contacts in eastern United States and Canada!

With this neat and powerful layout, using a pair of VT-127-A's in the final, L. E. Mueller, W8RLT, Plymouth, Mich., has put a consistent 50-Mc. signal across to Europe.

* V.H.F. Editor, QST.

January 1948
Until Nov. 5th, conditions remained good for trans-Atlantic work, though most such contacts were crossband to 10 meters, many of the European stations listening on 50 and replying on 28. PA8UN and PA96GN were the principal European 50-Mc. signals — and then came the glad news: the Gs had received official authorization, good until Dec. 31st, for 50-Mc. work. Subject to certain time and frequency limitations (stations within the London area must not operate after 1500 GCT; and some frequencies, mostly unimportant since they are well up in the band, must be avoided) British stations having such permission could join the fun.

And how they joined it! Even that first morning several were ready to go, and the first official two-way 50-Mc. QSO between G and W took place at 8 A.M. EST, Nov. 5th, with G6DII calling your conductor on 10 to say "Look for me on 50 Mc." Within a few days scores of Gs were on the band, but they had to wait a bit for their best licks, as ionospheric disturbances washed out the high m.u.f. over the North Atlantic path until about Nov. 15th, though conditions were good to the south and southeast from England on several days.

The first two-way G contact with MD5KW was made on Nov. 10th, by G6DII, and PA96UN duplicated this on the 11th. MD5KW had a field day on Nov. 12th, working ZS6DO, ZS6HS, ZS6JB and VQ2PL in an opening that lasted from 1550 to 2145 GCT. VQ2PL is reported to have heard a W8 in Cincinnati, Ohio, on this date. SU1HF, Cairo, Egypt, worked his first DX on 6, ZS6JB, on the 13th, and on the 16th he worked nine Gs — and another 50-Mc. DX convert was made! Hal has been watching for W signals, but has heard none at this writing. MD5KW has heard several W signals, but no two-way work has yet been done between North America and Africa.

During the latter half of November there was evidence that the area of high m.u.f. over the Atlantic Ocean was moving southward. W7FS/MM, aboard the Nathaniel Crosby at a position 700 miles west of the Azores, worked W5JVE and W5KYF, in the St. Louis area, crossband, with W7FS/MM on 29 Mc., and for several days thereafter he was hearing various Gs and PA8UN, as he neared the U. S. coast, off Cape Hatteras.

The first G-W5 QSO was made on November 16th, when G5BY worked W5JLY, San Antonio, Texas, at 9.20 A.M. CST. G5BY also worked W4HV and W4WMI, Raleigh, N. C., on this date. This was the first of a series of almost daily openings which continued through December lst. Ws VY, PRD, LIV, FSC and AJG are among the W5s known to have worked European stations.

November 22nd saw the appearance of FSOL, the first French station to make two-way contact across the Atlantic on 50 Mc., as several of his countrymen received the official go-ahead, though crossband work had been done two weeks before by FSZF, operating on 28 Mc. HB8VK, Zurich, Switzerland, the first to make it from his country, showed up the same day, his first contact being made with W1CGY, Enfield, Conn. This was probably second. His list of contacts, Nov. 22nd and 23rd, was quite impressive, including many stations scattered over most of the eastern half of this country. H38VD was doing well also.

Most European governments appear willing to grant their amateurs at least temporary authorization for 50-Mc. work, and quite a few more prefixes are expected momentarily, including OH, OZ, SM, I, OK and possibly others. The number of PA5s is increasing, and W contacts have been made by the following Netherlands stations: UN, GN, W1, and PA8UN leads the pack. With 100 watts to a pair of 507s, and a four-element array, David is well out in front. He has all U. S. call areas worked except W6 and W7 and is close behind G5BY in states and stations contacted. The following French stations are known to have official permission for 50-Mc. operation: FSOL, FSZF, FS8G, FS8H, F9FT, F8NW, F3CA, F8SN, F3HL and F8QL. Even better news is that FA8BG and FA8IH have official permission. Their geographical position is by far the best for W contacts of any stations in Africa thus far reported to be interested in 50-Mc. work.

The skip from Europe has been stretching out, and several Europeans are vying for the first W or W7 QSO as we write. W6UXN, Inglewood, Calif., heard G5W? (probably G5WE) on the 23rd, and on the 24th W6UXN was heard by G5BY at 9.16 a.m. CST, RST 359 on c.w., work-
ing W1CGY. G5BY has been reported heard by W7QLZ, Phoenix, Ariz., so the race for WACA from Europe may soon be won! G5BY has worked W6FB, Solon, Iowa, as early as 8:17 A.M. CST, and contacts with W4, W5, W9 and W0 are becoming more common. G5BY is up to 24 states worked two-way on 50 Mc. since Nov. 6th. His first contact with W6JZB came on Nov. 24th — the anniversary of the first trans-Atlantic coast bands contacts!

Not all the DX was between Europe and this country. On Nov. 5th, OA4BG, Lima, Peru, worked LU1CC, LU9AX, LU6DO and LU8BR; LU9AS, LU1DO, LU1CC, LU9AX, LU9MA and LU6DR were worked on the 10th. On the 15th, OA4BG and OA4AE heard W6JRM, La Mesa, and W6QG, Santa Ana, Calif., at a time when the band was open for transcontinental work from W6.

Some interesting “heard” reports come from ZS6GX, Germiston, Transvaal. On November 3rd, at about 1805 GCT, he heard a fading carrier in the old f.m. band, several of them from the last Coast, but only one contact, with W6BPT, so busy scouting DX along the east-west routes. He heard W9ZHL, W9AB, W8MVG and W8PUK, all on the 9th. In the afternoon, he heard the automatic transmission of J9clAO on Okinawa on the 8th, and contacts with W4, W5, W9 and W/J are being made more commonly.

The set-up appeared to be right almost daily for work between the Mainland and the Hawaiian Islands. W7ACS/KH6, Honolulu, reports reception of numerous stations up to more than 48 Mc. in the old f.m. band, several of them from the East Coast, but only one contact, with W6BPT, at 9:26 A.M. HST, Nov. 8th, had been made at this writing. As the great-circle path from north-eastern U.S. and VE1 to KH6 is not greatly different from that between England and Hawaii, it is still hoped that Gene may yet be able to knock off some eastern contacts. He heard the automatic transmission of J9AAO on Okinawa on the 8th, at 12:30 HST.

50-Mc. Oddities

November 15th was apparently better for north-south work than most of us realized, we were so busy scouting DX along the east-west routes. XE2C, Monterrey, Mexico, believed to be the only XE2 on 50 Mc., worked W5HSB, Springfield, Ill., and we have already seen that W6s were getting into South America.

Something of what we face in the matter of TVI may be seen from a report forwarded by W6GGM. He sent us a letter he received from a television-receiver owner in Roslyn Heights, N. Y., reporting reception of W6GGM “loud and clear,” on Channel 1, during the excellent east-west opening the afternoon of Nov. 4th. Until further notice, this stands as the TVI DX record. It’s beaten regularly in Europe, however, but it’s the f.m. stations (U.S.) who are to blame, not amateurs. British televiewers have been having a very bad time of it recently, with various high-powered U.S. f.m. stations operating close alongside their 45-Mc. video channel!

Working K17DY was a big thrill for all the gang, but probably W3OR, Essington, Penna., got the biggest bang of all out of it. Those who were on 5 prewar may recall that Alan was the victim of a gag whereby some fellow with a distorted sense of humor got on 5 during a hot opening in

50 WAS Mc.

<table>
<thead>
<tr>
<th>Station</th>
<th>Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>W4WMI</td>
<td>33</td>
</tr>
<tr>
<td>W4QG</td>
<td>40</td>
</tr>
<tr>
<td>W4GIY</td>
<td>40</td>
</tr>
<tr>
<td>W4WV</td>
<td>29</td>
</tr>
<tr>
<td>W4FJ</td>
<td>29</td>
</tr>
<tr>
<td>W4FNR</td>
<td>25</td>
</tr>
<tr>
<td>W4JL</td>
<td>20</td>
</tr>
</tbody>
</table>

Note: Only stations reporting their standings regularly are listed in this box. To get in send in a list of states worked, one call for each state, with the date the contact was made. Then report at least once every two months.
1941, working W3OR while signing the call K7GNN, and giving his location as that then assigned to K7GNN in the Call Book. Of course, our wise friend was one of those who was sure that such things were utterly impossible!

There have been some phenomenal low-power DX contacts made in recent weeks. On Nov. 29th, W1MUX, Wayland, Mass., raised G5BY with an input of 3 watts. He was reported R5 S6 on DX contacts made in recent weeks. On Nov. 29th, assigned to K7GNN in the tionably held by W2RRG, Atlantic City, N. J., that such things were utterly impossible!

Quite a few checks with G5BY, on various kinds of input of :watts. He was reported R5 S6 on DX contacts made in recent weeks. On Nov. 29th, assigned to K7GNN in the tionably held by W2RRG, Atlantic City, N. J., that such things were utterly impossible!

Another day, when only a few signals were heard to 51 Mc. restored satisfactory contact, however. A return to 50.1 and we were able to carry on solidly. It can be that sharp!

The east-west opening of Nov. 1st was obviously red-hot. Signals were heard as high as thei:e of days. On one particularly good opening we checkS to 50.2 Mc. dropped us down to S2, and a move to 50.3 dropped us down to S2, and a move to 50.3 put us out of the picture. A return to 50.1 and we were able to carry on solidly. It can be that sharp!

The farthest-north 50-Mc. station? KL7CM, Fairbanks, Alaska, claims the title. He's heard signals from W6, 7, 8 and 3, but has made no contacts as yet. Oh yes, the frequency — 50.2 Mc. Should be O.K. — KL7DY was doing all right on 51.2, which is about one megacycle out of the band, in most fellows' estimation!

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.

How to tell when the band is open — without spending lots of time listening? The Fresno area of Mississippi to go, W6UXN was practically to the point of making cash offers to owners of mobile rigs in W1, to finance a trip to this, the hardest of all states to get. There was at least one Vermont listener, however — W1A W, Falls, Vt., is also on, sharing 52 Mc. with W1AW at present, though he is expected to move lower soon. Both towns are deep in the Connecticut River valley, but these boys are determined to supply those long-sought Vermont contacts.
The Polarization Question on 144 Mc.

It must be that nothing phenomenal happened on 144 Mc. during November, as our 144-Mc. file is thin, indeed, this month. What correspondence we do have is devoted almost entirely to the matter of antenna polarization, and it appears that the horizontal forces are gaining ground, even in the predominantly-vertical East. The primary reason for sticking with vertical antennas, aside from the fact that we started that way, has been the protection of the interests of the mobile gang. It certainly is much easier for the mobile station to use a vertical antenna, and in work over flat or open terrain similar polarization at both ends will make a vast difference in the working range of the mobile station. In hilly country, where the mobile station is beyond line-of-sight a high percentage of the time, cross-polarization may not be too great a handicap, however. The question remains whether the disadvantage suffered by the mobile enthusiast is a sufficient reason for withholding the advantages of horizontal polarization from the rest of the gang. In this connection we invite comments from operators of mobile equipment who have had extensive experience in areas where horizontal arrays predominate.

One thing is sure: if we are to have extensions of the east-west DX record it will have to be with horizontal antenna systems, as practically all the better stations in the Middle West are now using horizontal arrays. W2CBB reports a definite trend in this direction, accelerated, no doubt, by reception of W9 signals in the metropolitan area in October. He has a 9-element affair and has abandoned the use of any vertical arrays, feeling that this will help the trend. W2AXC has a 5-element job, W2CCC has a 10-element flip-over, W2RH is checking a rhomboid, and others who either have horizontals or who are working on them include W2IH, W2SYW and W2FKL, W4FJ and others in the vicinity of Richmond, Va., are using horizontal arrays. Their presence at the southern end of Atlantic Seaboard openings should provide incentive for horizontals in W1 and W2. The chances are that there may be few opportunities for record-breaking DX before next spring, but W2GV points out that the first Eastern stations using horizontals will have a considerable advantage in working the gang in the Great Lakes area, if for no other reason than the reduction of local QRM from literally hundreds of stations, still predominantly vertical. And there are hundreds — note that W2NLY is now up over the 700 mark in stations worked on 144 Mc. in 1947!

Emergency Nets on 144 Mc.

The winter months provide us a good opportunity for mending our 144-Mc. fences. While there are good nights now and then, right through the winter, they don't happen so often, and there are many times when the band provides us with little more than line-of-sight range, unless we have high-gain antennas and the best of gear. In the rush to work DX, particularly during the warmer months, we often tend to lose sight of the fact that, after all, the 2-meter band is still essentially a local proposition. On probably no other band open to amateur use can we work so effectively over the short distances which are of such great importance in emergency operation. The winter period is a fine time to work out emergency plans. If you have a local net operating drop us a line, and we'll be glad to run the details in this department. If you don't have one, how about getting started?

Gs Prepare for Opening of 2-Meter Band

Having never had the opportunity previously of working above 60 Mc., the British are looking forward with considerable anticipation to the opening of the 2-meter band in England. Since they have no great accumulation of modulated oscillators and superregenerative receivers, they have strong hopes that they will get off on the right foot when 144 Mc. is released for amateur use over there. The British Isles, with their great concentration of population within a small area, should be a fertile field for 144-Mc. activity. It would appear that any station anywhere in all of O-land should be able to work any other under good conditions, and they may well work several European countries, as well. And trans-Atlantic work? Let those who would be first to say that such a thing is impossible examine the record of all our lower-frequency assignments before being too sure!

420-Mc. News

There is interest in 420 Mc. At least our QST story on 420-Mc. gear got a good going over, it appears. Several fellows have written in saying, in effect, "You showed us a 16-element array on the October cover; how about some dimensions?" Well, here they are. The array was a duplicate, in miniature, of the 16-element job used on 144 Mc., except for the method of feeding. For the middle of the band radiators should be 12¾ inches long, reflectors 13¾ inches. The phasing wires (No. 16, spaced one inch) are also 13¾ inches. The quarter-wave "Q" section is 6¾ inches long, and is made of ¼-inch tubing, spaced one inch center-to-center. Radiator-to-reflector spacing is 5½ inches. The array is fed with 300-ohm line. The model shown in the cover picture was made in knockdown form, for portable work. The elements are of ¼-inch tubing, and connection to

January 1948
them is made by spring-type grid clips soldered to the phasing wires. The array has a gain of approximately 15 db., and it works well in either a horizontal or vertical position.

Other readers have written in to let us know that we left off a dimension for the length of the line used in the 6J6 transmitter, described in the November issue. Referring to Fig. 2, page 14, the lines, \( L_1 \) and \( L_2 \) are 1\( \frac{1}{2} \) inches long. Under the receiver diagram, Fig. 3, the caption should state that \( L_2 \), not \( L_1 \), is vane-tuned.

Who, in working on a new and higher-frequency band, has not called CQ occasionally, just on general principles, not expecting an answer? W2HNY /2, operating from a 450-foot elevation near Westfield, N. J., was working W2LYP at Iselin, N. J., on schedule, as they have been doing for some time. After the workout was over Matty called a "CQ 420 Mc.," and lo and behold — an answer! And DX, too: W2AJT /2, Long Branch, N. J., some 35 miles away. W2HNY uses a Cardwell oscillator unit as a transceiver for his portable work, with a 16-element array, vertical or horizontal. W2AJT was testing a 20-element array, with a 703-A "doorknob" oscillator, running 10 watts input. That 703-A, incidentally, looks like a good bet for 420 Mc. and higher. You won't find much dope on it in the handbooks, but it's on the surplus market in some quantity.

W2HNY and W2LYP find that, in working between their respective home locations, an eight-mile path, they are unable to hear each other when they use their small transceivers for both sending and receiving. When they put on their oscillators, each of which uses an 8012 at about 20 watts, and use the transceivers for reception only, the circuit is solid. Both have 5-element horizontal arrays. When W2HNY goes to an elevated location the small rigs are quite O.K., though the distance is increased to 12 miles.

The polarization question is bothering them, too. W2HNY says it's an awful nuisance to have to listen to no signals with both types of polarization! What shall it be, fellows, horizontal or vertical? We suggest standardization on horizontal — now — unless someone has serious objections. The primary reason for retention of vertical antennas on 144 Mc. — to provide for the mobile enthusiast — is unimportant on 420 Mc., since practically all work will be with something more complex than a vertical quarter wave. If it's a beam, it might as well be horizontal as vertical.

There is more 420-Mc. activity in southern New Jersey. W2VX, Westville, and W2PEN, Runnemede, have rigs similar to the job described in November QST, and 24-element and 5-element arrays respectively. W2PAU, Westville, has a converter ahead of a broadband receiver, and a pair of 802s for transmitting. W2EH, W2KHW, W3ISE and W3FGQ are also active. The first

(Continued on page 148)
CONVENIENT JUNCTION BOX

The compact unit shown in Fig. 1 was patterned after a commercially-built unit, designed to provide a convenient a.c.-line outlet box for use in test set-ups requiring the application of power to several units at one time. It cuts down on the amount of “haywire” usually required in such cases, and eliminates the usual problem of “Where the heck am I gonna plug this in?”

Eight standard a.c. receptacles are mounted on the sides of a 3 x 4 x 5-inch utility box. A male a.c. plug and two fuse-holders are mounted on one end of the box. The wiring arrangement is shown in Fig. 2. It is suggested that the fuses be rated a little below the rating of the fuse in the house-wiring circuit that is used to supply the box. In this way, if a fuse blows, it will be the one in the box before the one down in the cellar!

Variations on this scheme will suggest themselves, and if desired, toggle switches may be mounted near each receptacle to give control of the individual circuits within the box. — W7JEQ

PROTECTIVE SYSTEM FOR 807 MODULATORS

The system shown in Fig. 3 was worked out to give double protection to a pair of 807s used as modulators. The circuit prevents screen voltage from being applied unless plate voltage is also on, and prevents the tubes from delivering output until the output transformer is loaded.

A high-resistance relay, Ry1, is connected so that it is actuated by the 807 plate voltage. Thus, when plate voltage is on, Ry1 closes, and therefore the plate voltage applies to the Class-C stage.

C — 8-ufd, 150-volt electrolytic.
R1 — 0.47 megohm, 1 watt.
R2 — See text.
Ry1 — High-resistance relay (10,000-ohm coil).
Ry2 — Low-resistance relay (12- or 24-volt coil).

If the voltage drop across Ry2 is too great, it can be shunted as shown in the diagram. Several values should be tried until the one that produces the lowest drop while still permitting the relay to close is found. — Howard K. Van Jepmond, W97JC

January 1948

FROM JEEP ELECTRONICS

SWITCH TO SAFETY!
How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD/1

How:

We rushed into the shack just in time to observe Jeeves determinedly pounding his head against the wall. And as he backed up to drive home the next blow, we hailed him unceremoniously into the corner and plunked the portly gentleman into an easy chair. Gulping a sedative, he struggled to regain his usual decorum. We then noticed an unfinished QSO in the log — in fact, it even looked unstarted.

He mumbled a tale of woe in his Lancashire drawl, something to the effect that after the VQ1 had replied with "QRZ? W9??/1 AGN PSE K" a veritable horde of W2, 3, 4, 6, 7, 8, 9 and VE chimers-in had burned a hole in the band, all a cycle or two apart. And sure enough, there was a little brown spot around 14,001 on the dial of our blooper!

"Where were the WIs and Ws on that play?" we asked, repairing the damage to the cellophane covering on KC4USA's card. We then placed a Band-Aid on Jeeves' palpitating pink pate, admonishing him to use another portion of the bulkhead during future tantrums. He was returning to his usual serene self and said that the Is and Js were giving an FPS a going-over a few cycles lower.

Well, we promised to put him in for HADH (Heard All DX Hogs) to tack up beneath his HAD (Heard All Diathermies) certificate in the pantry, and then sent him into that cubbyhole to shake a cocktail.

So Jeeves is again as unruffled as ever but the funny business on twenty goes on and on. It appears that the number of DX Hogs that takes the pledge is well counterbalanced by new arrivals. Anyway, we must hope and work for the best. You DX stations — you can do a lot in helping to set the standard of our conduct over here. It's mostly up to you to straighten out the overeager beavers on this end. As soon as shady operating ceases to pay off things will become much more FB. It's not easy to continue being polite and square while a few nocturnal nitwits zero-beat and walk off with prize packages.

The powers that be remind us all that there is a stack of QSL cards floating around these days having inadequate information on them; i.e., no dope indicating band used, whether 'phone or c.w., signal report, or even time and date. Even if you aren't rare DX your card may be needed by someone trying to piece together a 10-meter WAS. (All right, Jeeves, so everyone doesn't work ten.) Granted, it's a lot of work for operators of rare DX stations, especially after a DX contest or any long session with a flock of Ws, but an incomplete card is almost worse than no card at all — it's painful.

Well, conditions from eighty down through six are pretty hot right now with no letup in sight. A lot of short skip on the DX bands has made the going pretty tough, according to some sources. Let's see what gives among the gang these days.

What:

For reasons best explained by the technical department, eighty hasn't yet thoroughly shaken its mantle of summer QRN. That should account for the sparse reporting. Nevertheless, W1MEG's 30 watts accounted for G8JR and PA9NG. W3WIF also got those two and added F3ABG (3515) and OZ3HR (3530). W3FH worked some Europeans but couldn't locate any of his specialty, new countries, so he put back the coils with fewer turns. Via W3QV, we hear that ON4HC will be running for WAS on 3510.

Forty has been a little better. VE3BBR shifted from twenty to test a new final for the SS and was surprised to work some Gs, F9FM, G13CFI, PA1XU, E19J, CT1SX, and ZS1M (7110) while
using a 20-meter doublet. W2KIR unscrambled plenty of Gs, GD8UB, G16WG, GWXAU, GM3BV, F9EQ, H1MOE, OK1FP and UA3BD/UC2, and heard VF7NK. 

The typewriter-case portable at W9BRD/1 even worked some Europeans while tied to a short piece of inside wire, so conditions must be good. W5LAK rounded up HR1AT and ZL1NF with his pair of 6L6s. For some of the boys who are getting out and may not know it, G3CRR sends us a list of calls heard while on shipboard in the vicinity of Malta: Wls MBB, OOQ; W2s EUV, NU1, POG, UZQ, VO1; W3HRZ; W4UKM; and VE1OA and TH. HK5CR wants it known that he’s snooping for New Mexico on 7103 from 2:30 to 4:30 A.M. MST daily.

Ten meters is evidently making some of the boys happy. Even W1FII raised an eyebrow at MD7RJ (28,210). That’s Cyprus. W1EUK notes that he works VU best with the beam in the east and, in the morning, VK and PK peak a bit east of north. Vernon’s best of late include OQ5AR, OQ5BL, ZB1AG, ZB1AB, ZB1S, ZB2A, MD5TS, VS9AB, VQ3EDD, ST2MP, ZS4AF, ZS4I, VQ4KPB, ZD2KC, PK2RK, LZ1AB, SU1HE, VU2BF, VU2TM, CT1QA, CR9AG, CI8S, W2MV/C9, XZSDN, J8AJJ, J8AAM and a flock of other Js, ZEs, etc., all this being on the vocal. He’s up to 81 countries with his 140s and 3-element beam.

G2PL says that FUSAA (28,008) claimed their contact was the first FUS-Europe QSO. Peter now has 181 postwar with 152 confirmed and moans about having a punk location!

Here’s a rare shot—VR5PL and VR5IP, respectively, representing the entire ham population of the Tonga Islands. Noel and Bert spent the war together in the RNZAF and are now with Civil Airways on Tonga. They plan on taking a trip to the States upon completion of their tour of island duty.

W8DEN reports bad conditions and I1AHC/I6, J8AAW, W0SQS/Iwo, W2WMV/C9, FT4AN and CN5EE. We get a Guamish slant on things from W2-LAT/KG6 who has 40 countries worked in three weeks on the island. Of particular interest are V57NX, V57AP, CR9AN, HS1SS, VS1CF, ZX2HP, PK6NG, PK7VK, PK6XA and UA6UE.

January 1948
KG6AD, UB5BD, UA9DF, CN8EG, YR5AH and KK6AF without benefit of precipitation. A 160-meter half-wave at W7LAN has accounted for EI4J, UA8KAA, UA1AF, UA1KAE, OH8N6F, UC2AD, VS6AR and other niceties. A flock of stuff entered the log of W1NMP lately, accompanied by YA1A (14,000), XZ2DY (14,135), ZCJAK (14,150), VS6BA (14,070), GD2FRV (14,060), KM6AB (14,065), CR7BC (14,095), MD5SB (14,020), PK4KS (14,050), ZC1AL (14,030), J8AAM (14,110), J8AAS (14,093), J9ABL (14,095) and CT1IT. This brings Stan up to 135. In the Ozarks, W5ASG collected such as MD5KW, VQ5JTW, J8ASC, UA9PA, UB5AF, UB5CH, UB5BC, UD6AG, RAEM/MM, ZP6AR, VP3AII and VS6AR, plus J8AAB and VQ5DES on 'phone. A total of 117 countries has now been accumulated at W8AIIW. Late quotes are UC2CD, UD6BM, UQ2AB, UA9KCA, UA00A, UB5BF, YO5J, LX1AS, OE7CP, GC4LI, CT1AC, CR9AN, ZD4AP, CR7AF, ZS3D, C9JW and PK4KS. Lee has a full gallon and a 3-element rotary to play with. W8JM represents West Virginia this month, bringing along UR2KAA, EK1AA and GD3BBS for 70 countries since February in a poor location and with low power. That's what the man said.

On voice, W9NDA specifies KH6MQ/J9, MB9AB, LA2UA, VP1AP, HLA4AB, ZM6AF, XZ2AG, TR1P, SV1WE and AR8AB. Then Heck unlatched some brass on I6USA, ZC1AL, UA8KAA, UA00A, VP3AII and ZP6AR. He reports receiving a card from the Cape Verde Islands — it unfortunately being the one he sent CR4HT some time ago. Too bad; scratch another one. — Windor's VE1BSA collaborated with EP3D, HE1EO and MD5PC for 107 postwar. TA3SO, SM5XK, HH13L, LA5GA and OZ7SS were snared by W3CVA recently. — We note that W7BE gained MB9AM, MD5AA, XZ2QP, PK5LK, UJ3AD, U81AB, UA1KED (Franz Josef Land), GD2DF, V57AC, VU2DS, VU2GH, IA5B, HAEPE, YR5PK, YR5VF, VQ2JC and ZB1AI, as well as others of quality. Chalk up 113 for Bill, all on twenty c.w. His brother is ex-KX6USL, now W8VOE, by the way. — At W8RNQ we find CTI1T, KG6AL, EI4J, UB5CC, KV4AC, O5ELU, ZB1AH and ZE2JN, to get AI past the century mark. — Efforts by W8WWU resulted in W7TKK/VK9, W2LAT/KCG6, UD6AG, J2AAS, HK4AD (14,145) and UA3BD/U0C (14,060). — W4MZ evolved a folded dipole from a chunk of No. 12 wire (no joints, no splices, he claims) and latched onto UA8KAA, KB6FA, CT1LZ, UA9SH, UA8UA, P21WK, J2AAY and LU1ZA. — The summer's best for W6MLM included HC2KJ, XU6GRL, KAIH, KAIK, KAIrp, KAI7G, HK3AW, W2JSB/KG6 and W6WCN/KG6. — A mere seven days brought W0NTA 14 new ones, or up to 126 postwar. Vince vows to give W8WV and W8XXO plenty of competition from now on. — W5LAK is back again with OX1G, VK4AA, F4AED, KP6AB, KSBU/KG6, VP3JM and HK3CK. — XT9F (14,100) provided a fancy contact for W6EFM while airborne in a transport in the vicinity of Canton, China. He gave the mail address as % C. A. T., Hungjao Air Field, Shanghai. — The 450 watts at KP4KD has accounted for 101 countries in six months. Ev recently added PX1Z and ZD3B, making it 120 on the nose. — W2QHH's 40 watts is still at it. We mean a 1-day WAC and contacts with XAFQ and KB6PA, to give Howy 102 postwar. Sensational QRP DX is nothing new for this guy — you'll remember him as prewar W8JTW with a 17-watt DXCC. Furthermore, he doesn't lean on a VFO! Not bad for an amateur. [Enough of that. — Jeeves] — The big boom from Bloomfield, W2CWE, accounts for ZM6AF (14,077), MD5DA (14,017), J9ABL (14,075), VP3TR (14,053), VS1BG (14,123), VSTES (14,064) and a group of others already mentioned. Ed's score is 78 verified out of 119 and he's worried about his average. Some systems must be better than others, as W2QHH has verified 91 out of 102 worked. How about that, Howy — what's the secret? But if it involves sending a BC610E or something to each new one, skip it! — Between whipping up crepe suzettes and fancy frostings, W2DMJ sizzled his 750 watts on a pile of stuff, along with VK9BI, UA8AF, UA4PA, CN8EH, LA3SA, OX3CB and G2XM/MM. Then Frank warmed up the Class-B in conjunction with D4ATG and OX3MC. The mast under his beam pretzelized under a recent breeze, so I guess we all have our troubles.

The rig at VK2AGU, Sydney, looks more like it belonged to a W than a VK; HRO and BC-345 receivers, separate transmitters on 10, 20 and 40, and rotary beams on 10 and 20. Harry has worked 96 countries on 'phone postwar. He never runs short of second operators — his two sons are VK2GD and VK2AI.
Poor W2HAZ isn't living right, or something. He would like to know if he can qualify for WAP (Worked All Phoneys). Guess not, Bill. They haven't all got on, yet. In spite of this circumstance, he did all right for a bunch of Russians and some J's. Complaining of working nothing but run-of-the-mill stuff, W2TUD wangled UA3VX, OH8NF, OH3OR, OX3RD, C6HII, UB5KAA and VQ3HJP, plus about fifteen other notables—all in one six-hour session. W6ZZ couldn't beat off J5AAN, CR7-BC, J2AVA, PK4TO and VS2CE with a baseball bat but against OBS QSTs, needing just a few more to go over the mark.

Where:

Mailing points aren't quite so plentiful this time (hint, hint), but here are a few that should do someone some good:

- OH1CC
  U.S. Army Advisory Group, Signals Section, APO 909, P.O. Box 409, Shanghai, China.
- OH1SL
  P.O. Box 51, Tientsin, China.
- OH3NH
  Navy 214, P.O. Box 71, New York, N.Y.
- OH27GO
  (via W4WW)
- MB4AE
  (via SG5B)
- MD3C
  BOGC, Tripoli, North Africa.
- OY3CP
  Box 71, Graz, Austria.
- PK7VK
  Radio Section, Black Island, Dutch New Guinea.
- VP6AS
  Milford, Pennsylvania Field, Jamaica, W.E.A.R.
- VK9BI
  (via W3JL)
- VQ4RAW
  P.O. Box 1013, Nanyuki, Kenya.
- VQ5AB
  Box 355, Fort Louis, Mauritius.
- VQ5CQ
  Box 425, Singapore, Straits Settlement.
- VQ5OB
- VQ5BA
  100 Austin Road, Hong Kong.
- VQ5BV
  (via SG5B)
- WSWEA/Truk
  Harry T. Phillips, Jr., USN, Service Schools Command, San Diego, California.
- WSWEA

These, thanks to W1CLS, W1SU, W2DMJ, W4CCH, W6MX, W8WEA, W8WWU, W9AIW and VS9ET.

Tidbits:

A pile of 163 postwar has kept W2AGW quite busy. He also is wrestling with a new 50-foot steel tower which the local authorities are frowning upon. CN8EG tickled W2HMJ pink with an unusual cartoon QSL. Grab that one for your collection, gang. All who worked VQ4MNS after September 9, 1946, can roll up their sleeves and do it all over again. This advice from ex-VQ4MNS, now ZE2JO, who relinquished the call on that date and it has never been reissued. Watch for ZE2JO on 7, 14 and 28 Mo.

KZ5AD is in dire need of Nevada, Idaho, Wyoming, Colorado, Rhode Island and Vermont for WAS and Sarge says QSL is always 100 per cent from his end.

ZB1AB donated the following info through W8CEI: As of November 10th, the following Malta calls had been issued: ZB1E, H, L, Q, S, AB, AC, AE, AF, AG, AL, AH and RL. Also, ZB1A, wherever he is, is not in Malta.

The prefix as in XP49PN is evidently for portable use over there, as W4DCW recounts working this station twice, and receiving the location as Exhibition Island, QSL via PA0PN’s QTH.

The Department of Military Science and Tactics at the University of Minnesota has W6DSF in operation in the rear of a classroom. The first week of use provided a flock of European QSOs. W6HPJ, an instructor, is responsible for the works.

Ex-VU2JG, now G8CJG, has left for VQ5 and VQ4 complete with rig. He hopes to drop into VQ1 for a while, too. Along this line, VQ3HJP slipped us an interesting sidelight on things in Dar-es-Salaam. He has an interesting story regarding the name of the place and you might get him to elucidate sometime should you catch him in an RCC mood without too many pursuers on the frequency. We are endeavoring to get a good shot of VQ3EDD’s vertical doublediamond beam which keeps knocking our ears off.

In climatic contrast to the picture on page 65, here is Coastguardman G. G. Bartoo, who gave the gang a lot of Greenland contacts while signing "Bart" at OX3BD from March through October, 1947. Nice and cozy, but can he get out of that thing?

Continued on page 142
First V.H.F. Sweepstakes

BY F. E. HANDY, * WIBDI

Activity on v.h.f. is now at an all-time high, so it's time we scheduled an "SS" to see what over-all communication results can be rolled up in a week-end devoted exclusively to v.h.f. operating!

Accordingly, the First V.H.F. Sweepstakes will start at 2:00 P.M. your local time, Saturday, January 17th, ending at midnight Sunday. The aim of the contest will be to work as many v.h.f. stations as possible in one week-end. All points from such work will be multiplied by the number of different ARRL sections worked. New station records are invariably made in each regular SS and we expect the V.H.F. Sweepstakes to be no exception.

Phone, m.c.w. or c.w. may be used. Since contact has to be fairly good to prove a QSO, customary SS exchanges (for the report sent Hq.) will be required. Exchanged information is in the form of a message preamble, with the ARRL section substituted for the city and state, and the RST report for "check." Any station you work is good for one point in the score, if you get the other operator's acknowledgment, whether he is score-building or not. If an exchange of SS data is completed, two points may be claimed.

This V.H.F. Sweepstakes will be operating fun as well as a means of providing an unexcelled test of possible station coverage in a January week-end.

Awards—Individual and Club

Distinctive certificates will go to V.H.F. Sweepstakes winners, one in each of the 71 ARRL sections. By such section awards all operators compete under transmission conditions common to their vicinity.

When three or more individual club members or hams invited and reported by one club, compete and submit logs naming the club with which they are identified, an ARRL certificate will be issued through such club to the leading individual in the local competition. When less than three individual logs are received there will be no club award or club mention.

A gavel with engraved sterling-silver band is also offered to the club whose secretary submits the greatest aggregate score, which is the tabulation of all individual V.H.F. Sweepstakes score claims successfully confirmed by individual amateur reports which mention the club.

The General Call

"CQ Sweepstakes, this is W••••, over" will identify stations desiring to make contest exchanges. On c.w. this becomes simply "CQ SS de W•••• K." Use any authorized v.h.f. band, 50 Mc. or above. Every licensed amateur who can work on v.h.f. and who lives in any field-
## STATION W. — SUMMARY OF V.H.F. SWEEPSTAKES EXCHANGES

<table>
<thead>
<tr>
<th>Freq. Band (Mc.)</th>
<th>SENT (1 point)</th>
<th>RECEIVED (1 point)</th>
<th>Number of Each New Section as Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NR</td>
<td>Sm.</td>
<td>CK-RST</td>
</tr>
<tr>
<td>50</td>
<td>1</td>
<td>W1AW</td>
<td>57</td>
</tr>
<tr>
<td>50</td>
<td>2</td>
<td>W1AW</td>
<td>43</td>
</tr>
<tr>
<td>50</td>
<td>3</td>
<td>W1AW</td>
<td>38</td>
</tr>
<tr>
<td>144</td>
<td>4</td>
<td>W1AQ</td>
<td>40</td>
</tr>
<tr>
<td>144</td>
<td>5</td>
<td>W1AX</td>
<td>57</td>
</tr>
<tr>
<td>50</td>
<td>6</td>
<td>W1AW</td>
<td>54</td>
</tr>
<tr>
<td>144</td>
<td>7</td>
<td>W1AX</td>
<td>58</td>
</tr>
<tr>
<td>144</td>
<td>8</td>
<td>W1AX</td>
<td>57</td>
</tr>
<tr>
<td>144</td>
<td>9</td>
<td>W1AW</td>
<td>34</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>W1AH</td>
<td>479</td>
</tr>
<tr>
<td>50</td>
<td>11</td>
<td>W1AH</td>
<td>389</td>
</tr>
</tbody>
</table>

|                  | NR | Sm. | CK-RST | Section | Time | Date (Jan.) |
|------------------|----------------|----------------|-----|
|                  | 3  | W1IJ | 47 | Conn. | 4:18 P.M. | 17 | 1 |
|                  | 7  | W1DHQ | 59 | Conn. | 4:40 P.M. | 17 | 2 |
|                  | 6  | W1MF | 399 | Vt. | 9:11 P.M. | 17 | 2 |
|                  | 52 | W1DGQ | 58 | E. Mass. | 9:39 P.M. | 17 | 3 |
|                  | 15 | W1AP | 58 | Conn. | 9:40 P.M. | 17 | 2 |
|                  | 11 | W2HE | 48 | N.Y. C.-L. | 11:32 P.M. | 17 | 4 |
|                  | 30 | W1IH | 57 | Conn. | 11:35 P.M. | 17 | 2 |
|                  | 21 | W2QON | 59 | W. Pa. | 11:55 P.M. | 17 | 5 |
|                  | 18 | W1XX | 59 | E. Y. | 12:34 A.M. | 17 | 6 |
|                  | 27 | W1DQH | 59 | W. Mass. | 8:47 A.M. | 18 | 7 |
|                  | 12 | W5HHO | 399 | B. Tex. | 8:20 P.M. | 18 | 8 |
|                  | 20 | W2HIJ | 599 | Maritime | 11:35 P.M. | 18 | 9 |


**Number and names of operators having a share in above work.**

Claimed score: 23 points X 9 sections = 207.

I hereby state that score and points set forth in the above summary are correct and true.

**Equipment:***

- Tube line-up
- Number different stations worked

---

**Rules**

1) Contest exchanges must include all data shown in the example explaining contest exchanges.

2) All work must fall in the contest period. All work must be on authorized amateur frequencies, and modes, above 50 Mc.

3) All work to be submitted must be accomplished from points within a given ARRL section.

4) Fixed-station or portable or mobile operation under one call may be combined and submitted as one score.

5) A contestant is a single operator working with no help permitted by any other person during the contest. Scores claimed must be presented with names of all participating operators and only single-operator scores count toward section certificates.

6) No crossband work shall be counted for any points or sections in the contest.

---

7) **Scoring:** Contacts count:

- *One point for each QSO completed.*
- *Two points for each QSO when the required information is exchanged both ways.*

For final score, multiply totaled points by the number of different ARRL sections worked, that is, the number in which at least one SS point or exchange has been made.

8) **Contest period:** The contest shall start at 2:00 P.M. your local time, Saturday, January 17, 1948, and ends at midnight, Sunday, January 18th, your local time.

9) **One contact per band may be counted for each different station worked.** Example: W1XYZ works W3PDQ on 50, 144 and 235 Mc. for complete exchanges, two points each on each band. 2+2+2 equals 6 points but only one section multiplier.

10) Sections are determined by obtaining at least one point by actual contact with a station operating in the section, and work in additional bands with stations in this section shall not increase the section multiplier.

11) Award Committee decisions shall be accepted as final.

12) Reports from all stations must be postmarked no later than February 2, 1948, to be considered for awards.

(Continued on page 150)
AUSTRALIA
The Wireless Institute of Australia advises that VK amateurs are permitted to employ frequency modulation on amateur bands above 50 Mc. and on 27.185 to 27.455 Mc. Pulse transmissions are allowed on the 166-Mc. and higher bands.

QSL BUREAUS
Changes and additions; complete lists will be published as usual in the May and October issues of QST.

Canal Zone: Canal Zone Amateur Radio Association, Box 407, Balboa.
Cook Islands: Ray Holloway, P.O. Box 65, Rarotonga.
Dominica: VP2DC, Roseau.
Greenland: 1385th AAF Base Unit, APO 858, N.Y.
Grenada: VP2GE, St. George's.
Montserrat: VP2MY, Plymouth, Montserrat.
Northern Rhodesia: VQ2DIH, Box 93, Livingstone.
Palestine: VP2SA, Kingstown, St. Vincent.
Philippine Islands: Eulalio G. DeCastro, Radio Training Institute, Manila.
St. Vincent: VP2SA, Kingstown, St. Vincent.
Trinidad: Edgar H. Borde, 52 Moeurapo Rd., Port-of-Spain.

COLOMBIA
The members of the Liga Colombiana de Radiacionados recently elected the following amateurs to its Board of Directors:
President: Pompilio Sanchez, HK3BH
Vice-President: Josue Gomez P., HK3CV
Hon. Secretary: Aurelio Linero P., HK3CK
Hon. Treasurer: Carlos Fernandez, HK3BF
Auditor: Luis Caicedo R., HK3AO

FRANCE
The Reseau des Emetteurs Francais will sponsor a contact contest called "Trophee Pierre Louis" from 0600 to 2400 GCT on December 28, 1947. The competition is for members of REF who operate 'phone.

French contestants may exchange verification groups with foreign stations provided that the latter confirm the groups sent by letter to R.E.F. headquarters.

CHILE
The Radio Club de Chile has recently elected a board of directors, to serve a two-year term ending October, 1949. The new officers are as follows:
President: Jose Lena L. CE3AY
Vice-President: Ramon de Valle CE3AM
Secretary: Luis M. Desmaras CE3AG
Treasurer: Jorge Bernain CE3DG
Directors: Alberto Stagmaier CE3AS
Antonio Chanes CE3AE
Rene Arangua CE3AW
Alfredo Quintana CE3DZ
Roberto Varela CE3DS

JAPAN
J2USA, the headquarters station of the Far East Amateur Radio League, is in full operation. The services of its station and its personnel have been offered to the United Nations for relaying pertinent information, as well as to occupation personnel in general in handling personal messages.

An emergency net in Japan is being planned. All J amateurs have been requested by F.E.A.R.L. to cooperate in the emergency program.

When F. J. North, G2CDI (now VP2CDI), first came to Barbados, the event was celebrated by this gathering: Standing, usual order: Stewart, VP6ZI; Elliot, VP6ZI; Murphy, VP6KM; Richardson, VP6JR. Sitting, left to right: Reece, VP6PR; Olton, VP6FO; North, VP2CDI; and Croney, VP6JC.
Editor, QST: I followed with a great deal of interest the work done by the League in connection with maintaining frequency assignments to amateurs. Now that the results can be evaluated, I want to compliment the officers and men on the wonderful job they have done. Without the leadership and ability and long experience of the present officers of the League, it would have been impossible to have continued with the frequency assignments which the amateurs now enjoy. ... — D. J. Angell, W6CTYQ

Norfolk, Virginia

Editor, QST: Re: Atlantic City Conference and the gripes of W5FNA and W1NXT. We lost 60 kc. and gained 450 kc. What are they griping about? ... — Bus Etheridge, W4KYD

253 Albert St., Stratford, Ontario

Editor, QST: I have just read, with deep distaste, letters on the above subject in November QST from two gentlemen who, from the fact that they possess call signs, we must assume to be hams. I should have thought that even an elementary knowledge of the problems of international telecommunications would have sufficed for them to realize that we amateurs have been fortunate to have emerged from this conference as well as we have. May I, a visitor from another hemisphere, say that we, outside America, realize that this is largely due to the magnificent work done on behalf of amateurs by the ARRL, and the support given by your Government. Without this great effort we, in the "outer darkness," would have had a very tough time indeed and from talks I have had with fellow hams, during the last few months, over a fairly wide area of the globe, I can say that this is fully and warmly appreciated. One can only hope that remarks such as those in the two letters mentioned will never be uttered over the air and cause the authorities to regret and withdraw their support. ... — Stanley Woolmer, V81AY

2001 Harris Place, Seattle 44, Washington

Editor, QST: You know, it is really surprising what the attitudes of some of the fellows are. They've said, "The heck with the thought. What the heck will we find that we will do? We lost 50 kc. and gained 450 kc. What are they griping about? ... — Ken Claar, W7LAR

2008 N. Cleveland St., Arlington, Va.

Editor, QST: I note in the Correspondence Section of November QST that some of the brethren feel disgruntled about the manner in which ARRL fights for our frequencies. Particularly are they unhappy about Atlantic City.

If there is a more effective way to protect amateur rights than the methods used by ARRL I, for one, wish those fellows would tell us. They are not helping by griping and criticizing through general statements that say nothing. Let them give us a concrete proposal of what should be done and how!

Amateur radio has grown in the respect of other services simply because we have cooperated and exchanged ideas within our own ranks. This doesn't mean that we must follow the leader and agree with every move ARRL or any other amateur organization may make. We owe it to amateur radio to speak up if we know a better way of doing things. But it is a sound principle of acceptable human behavior to criticize only when you are prepared to suggest a definite remedy. — Everett L. Bates, W4IA

[Editor's Note: We acknowledge, with thanks, comment in similar vein from W2PUD, W7WJ, W7LHI, W5EGO, VE2AFJ, W7HBO, WTKJE, and the Chicago Radio Traffic Assoc.]

TAKING STOCK

201 North Trenton St., Arlington, Virginia

Editor, QST: ... We cannot ignore the fact that a basic factor in the history of amateur radio has been the spirit of cooperation that existed within the group. Much of our strength was there.

That spirit appears to have been largely replaced by the same doctrine prevalent among Sunday drivers — lots of horn, lots of power, but no brake. Go into almost any radio club meeting; you will find, in the open or smoldering, the very same schisms that appear on the air. Instead of presenting a united front that will give us standing in our field of interest, we are bickering and quarreling like a group of juveniles.

Looking back more years than I like to admit, I can recall a discussion with a good friend of amateurs everywhere, A. A. Hebert, and in the course of it he remarked that the only thing amateurs seemed to agree on was the infallibility of all other amateurs — against outside attack. It is perhaps just as well that "A. A." did not live to see us as we are today.

I should like to suggest that all amateurs take stock, not only of their operating practices, but also of their general attitude toward the hobby. Is it one that would give us standing in our field of interest in radio communication. No one will lose contacts if we practise a little courtesy, a little consideration, and a lot of common sense. If we don't — and the handwriting is pretty clear on the wall around Washington — we stand a very good chance of finding that by failing to hang together we are all hanging separately. — A. W. Smith, W2AFJ/F

PUBLIC SERVICE

Shepherd, Tenn.

Editor, QST: ... My ham experience goes back to the days when amateur radio had a very insecure hold, and most hams felt that they had to justify themselves by a certain amount of public service.

The need is just as great today, but the latter-day hams don't know it. They come along and ham radio seems an established thing, safe and secure. They get their ticket and assume that they are free to follow it like any other hobby — like playing golf, for instance — and without any par.

(Continued on page 168)
V.H.F. SS; ARRL Week and Member Party. Want to find out what v.h.f. can do in a whole week-end of planned operating? The first V.H.F. Sweepstakes (January 17th-18th) mentioned last month is announced fully in this issue. Since work on our lower frequencies will not compete, we expect to meet a lot of the old familiar calls on these bands! All League appointees have arranged a joint operating program with the ARRL Member Party (annual event), January 24th-25th. The week between these two outstanding activities has been designated as "ARRL Week" and President Bailey has consented to give us a special message (by radio from all ARRL OBS appointees including W1AW) to be transmitted throughout the week. Fraternism, experimentation, traffic and several other aspects of our many-sided hobby are, we think, worthy of individual attention during this special week. The first of the year is a good time to look over activities and investigate new fields in addition to doing right by our current responsibilities. All members who are on the air should find enjoyment and new contacts in the Member Party which climaxes the week. See you there!

Emergency Note. W5IGO, in her Oklahoma Traffic Net Bulletin (No. 5), comments on recent Gulf Coast hurricane emergency operations. "Much traffic moved well outside the protected frequencies... an orchid to the amateurs (cited) for a job well done..." One lesson learned in the hurricane was that to put into practice the best plan, one needs advance planning, organization and tests as stressed in last QST. The emergency-powered stations in the storm area should aim to work with relatively near-by stations having power, so that QRN and QRM are of no practical consequence. These outlying stations should connect with appropriate outlets which means, of course, traffic nets such as OLZ..."

Join the AEC. In affiliating oneself with the ARRL Emergency Corps we are supporting the public-service value of the amateur... providing additional evidence that our individual licenses are in the public interest, convenience and necessity. Each operator, regardless of the frequency band normally used, is needed in the Emergency Corps and is most cordially invited to subscribe to its principles. Aim to participate through organized amateur radio in the event of communications breakdown. Assure familiarity with AEC principles and a place in its practical plans through membership. Full membership in AEC will be granted every station that can be active. Supporting membership is gladly extended where you subscribe in principle but have only limited time for AEC activity.

Qualifying Runs Expanded. W9CO has kindly arranged to transmit a prepared tape with the same text and at the same time as W1AW on the monthly runs, to aid in individual amateur qualification for 15-, 20-, 25-, 30- and 35-w.p.m. ARRL Code Proficiency Certificates. A first run (announced by radio) for November 12th was most successful and brought W9CO some well-deserved fan mail. Every amateur deserves to get for himself the concrete proof of continuing proficiency — and interest in higher proficiency — as evidenced by one of these certificates! See full announcement of current Code Proficiency schedules elsewhere in this issue. There are "fixed credits" in the Member Party for successfully getting our ARRL president's message; also for successful copy on a CP run. Patronize W9CO or W1AW on January 19th and get all that's coming to you.

Honest Reporting. All amateurs are invited to send a radiogram or letter requesting a copy of Operating Aid No. 3, comprising the RST definitions, and to use this faithfully in signal reporting. This is the best answer to the following comment recently received: "In keeping an overseas sked, I have used the R and S reports to advantage. Both operators have a pretty fair idea of the value of the circuit, and we pace our sending accordingly... There is a school of thought which claims that hams will always try to flatter the guy at the other end and never give accurate reports. I even recall one fellow who got up a printed QSL card showing RST 599! Too often, even a T7 or T8 report is cause for a W to shudder and visualize FCC tickets descending on him. It is stupid to allow our individual reports to develop into meaningless flattery when they can be such excellent tools. What good is a language if everyone has a different meaning for the same word?"

On the same subject, W6ZNP says, "What I find written on some cards today as an excuse for..."
a signal report bothers me. What does a report like QSA5 R7 mean?" Hybrid use of Q code and the popular RST system is definitely confusing. Let us use the recognized definitions. Start a message for one of our RST Operating Aids cards today.

**DX Control — by DX Stations.** Simple procedure can control DX situations. W2TXB, ever pushing his countries score closer to the 100 mark, suggests a campaign to get the DX gang to listen and work fellows off their frequency. Two pointed examples are given in his letter:

1. "The other morning CR9AN called CQ with QLM1 after his identification. What a difference there was not to have all that bedlam on his frequency. (There were one or two jerks still there.) But after such a call, when the guys dash down to the low end of the band, they will not all be on the same frequency. In setting ECOs and approaching the band edge with due caution, they automatically spread out properly so any one can be worked with best chances of a good QSO!

2. "CR4AX called CQ and when he stood by I never heard such a bedlam on his frequency. An LU landed him but long before he was through it started all over again. CR4AX said he was running 15 watts, and after hearing the mess he apparently gave up the battle for I never heard him again. The same happens when CR6AI is on."

These examples speak for themselves. But CR4AX, CR6AI and others can control this calling situation almost at will. Wherever appropriate and courteous disposition to exercise patience and off-frequency calling sense is apparent, we recommend the use of instructions after the calls of all DX stations.

Here are the ARRL-recommended abbreviations. These follow either a CQ or any call concluding a QSO, when those stations, remote from the North American continent, are not shutting down (can be indicated by CL of course), and when other stations are welcome to call them to establish contact. Tell W-VE operators from what part of the band you intend to start tuning your receiver! Note how greatly this improves the efficiency of conducting contacts for all! Use the following:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM</td>
<td>Will start to listen at high-frequency end of band and tune toward middle of band.</td>
</tr>
<tr>
<td>MH</td>
<td>Will start to listen in the middle of the band and tune toward the high-frequency end.</td>
</tr>
<tr>
<td>IM</td>
<td>Will start to listen at low-frequency end of band and tune toward middle of band.</td>
</tr>
<tr>
<td>ML</td>
<td>Will start to listen in the middle of the band and tune toward the low-frequency end.</td>
</tr>
</tbody>
</table>

Example: If the procedure will be to tune from the middle of the band to the high end, a CQ call should include: By words — CQ DE CR4AK HM; by voice — simply use the words for which the abbreviation HM stands.

---

**Addressing Traffic Correctly.** WINBS, in reporting on the ARRL Simulated Emergency Test (October), advises that the technique of work with message texts deserves much more discussion and attention at AEC meetings. Rough drafting, editing for conciseness, reexamining for clarity, compressing thoughts and insuring that the choice of words will convey the exact meaning desired, while remaining as free from phonetic arrangements that produce garbles when relayed by voice or telephoned at destination, require study and practice of radio handling! In emergencies, addressing traffic correctly and completely is extremely important. At originating points individuals should secure exact and complete addresses and not accept for transmission traffic for Smiths and Joneses in New York, Chicago or Los Angeles!

**Operator "Sines" vs. Nicknames.** In the course of a recent rag-chew an amateur asked us what was the difference between our operator "sine" and nickname. He had heard both. Our sine is FH, our nickname Ed. The operator sine is probably as old as message-handling tradition itself. It is that identity of an operator which he places with the handling data on the bottom of a message blank or transmits over the circuit to show responsibility when receipting for messages. Every real operator should have such an official radio signature. Nicknames are often used in familiar fashion in operator chats. A nickname may be taken into use as a sine. But these are too often duplicated. We have several Eds and Als on our staff. Where several fellows operate in the same station, group or community, distinctive operator signatures become essential. The sign or private signature for use on your radio circuit is traditional. Frequent use of sines and nicknames is fraternal and commendable.

— F. E. H.

---

January 1948 73
The following clubs are additions to the "ARRL Affiliated-Club Honor Roll" which appeared in the June, 1947, issue of QST, on page 72:

- Albany Amateur Radio Club, Albany, Georgia
- Amateur Radio Transmitting Society, Louisville, Kentucky
- Capital City Radio Club, Helena, Montana
- Connecticut Radio Club, Conneticut
- CQ Radio Club, Terrington, Connecticut
- Delgado Radio Club, New Orleans, Louisiana
- Frankford Radio Club, Philadelphia, Pennsylvania
- Helix Amateur Radio Club, La Mesa, California
- Honolulu Amateur Radio Club, Honolulu, T. H.
- Houston Amateur Radio Club, Houston, Texas
- Huntington Radio Club, Huntington, West Virginia
- Interity Amateur Radio Club, Irvington, New Jersey
- Kaw Valley Radio Club, Topeka, Kansas
- Kingsport Amateur Radio Club, Kingsport, Tennessee
- Main Line Radio Club, Philadelphia, Pennsylvania
- Mid-South Amateur Radio Association, Memphis, Tennessee
- Midway Amateur Radio Club, Kearney, Nebraska
- Mount Shasta Amateur Radio Club, Mount Shasta, California
- Newington Amateur Radio League, Newington, Connecticut
- Niagara Radio Club, Inc., Niagara Falls, New York
- Order of Brass Pounders, Chapter 3, Kansas City, Missouri
- Parkway Radio Association, West Roxbury, Massachusetts
- Skyways Amateur Radio Club, LaGrange, Georgia
- South Lyne Beer, Chowder and Propagation Society, South Lyme, Connecticut
- Southeast Radio Club, South Gate, California
- Sunrise Radio Club, Laurrelon, L. N., New York
- T-S Society, Ocean Grove, New Jersey
- Valley Radio Club of Eugene, Eugene, Oregon
- Wichita Amateur Radio Club, Wichita, Kansas

Additional volunteers are needed to send code practice by radio. Schedules may be arranged to suit your convenience. Suggestions for conducting code lessons are available from the Communications Department. A combination of voice and code transmissions is most effective. If you are operating on 28 Mc, and would like to help in the ARRL Code Practice Program, drop us a postal indicating your interest and we'll send further details.

Those using the available practice are urged to correspond with the amateurs making the transmissions so that those who give this useful service may plan their lessons best to aid their listeners.

**W.A.V.E. CERTIFICATE AWARD**

Back in 1939, the Canadian Amateur Radio Operators' Association (affiliated with ARRL) sponsored the W.A.V.E. award. Up to the time of The Great Silence, no one submitted proof of working all VE provinces according to the rules which state that two different stations in each province must be worked on two different bands! Three awards since have been won. Ex-W9VKF, now W1VG, was recipient of the Number 1 certificate while a resident of Peoria, Illinois. "Pete" is now hot after his next one from W1! Here are the rules:

1) The applicant shall submit proof of contact with two different stations in each province, contacts being made on two different bands. Yukon and Northwest Territories shall be considered a part of British Columbia.
2) All contacts must be made on or after January 1, 1939.
3) Applicants residing in territory designated by the prefix VE or W shall make all contacts from within one state or province.

A handsome certificate will be awarded for this accomplishment. Submit QSL cards as proof to C.A.R.O.A. Headquarters, 46 St. George Street, Toronto 5, Ontario.

**FLORIDA FLOOD EMERGENCY**

The Tropical Radio Club, Miami, Fla., was on its toes during the floods which resulted from the two hurricanes that swept through the Miami area during the month of September. When the American Red Cross called for volunteer hams to man their equipment, 21 operators responded.

The Red Cross had an ART-13 transmitter at its main headquarters in downtown Miami with mobile units stationed in the flooded areas of Hialeah and Opa-Locka. The OMs and YLs of the Tropical Club operated on a 24-hour basis with the aid of mobile units stationed in the flooded areas of Hialeah and Opa-Locka. The OMs and YLs of the Tropical Club operated on a 24-hour basis with the aid of mobile units stationed in the flooded areas of Hialeah and Opa-Locka.
WIAW OPERATING SCHEDULE

Operating-Visiting Hours

Monday through Friday, 8:30 A.M.–1:00 A.M. Saturday, 7:00 P.M.–2:30 A.M.
Sunday, 3:00 P.M.–9:00 P.M.

A mimeographed local map showing how to get from main state highways (or from Hq. office) to WIAW will be sent to amateurs advising their intention to visit the station.

Official ARRL Bulletins containing latest information on matters of general amateur interest are transmitted on regular schedules:

Frequencies: 3555, 7210, 14,150, 28,060 and 52,000 kc. (voice - 3950, 14,280, 52,000 kc.)

Times: Monday through Friday, 8:00 and 11:30 P.M. EST
(0100 and 0430 GCT, Tuesday through Saturday)
Sunday: 1:00 P.M. and 8:00 P.M. EST (0900 Sun. and 0100 Mon., GCT)

Bulletins are sent simultaneously, first at 25 w.p.m. and then at 15, 20, 25, 30 and 35 w.p.m. Approximately ten minutes practice is given at each speed. Next certificate qualification run is scheduled for Monday, January 19th.

General Operation: WIAW engages in two-way work with amateurs, as follows:

Monday through Friday, all times EST — 11:00 A.M.–11:30 A.M. ........ 20,060-ko. c.w.
11:30 A.M.–12 noon ........ 20,150-ko. c.w.
3:00 P.M.–3:30 P.M. ........ 14,280-ko. voice
3:30 P.M.–4:00 P.M. ........ 14,150-ko. c.w.
5:30 P.M.–6:00 P.M. ........ 3850-4000-ke. voice
6:00 P.M.–6:30 P.M. ........ 7210-ko. c.w.
7:30 P.M.–8:00 P.M.* ...... 3555/7210-ko. c.w.
9:00 P.M.–10:00 P.M. .... 3555-ko. c.w.
12:15 A.M.–1:00 A.M. (Pmns. through Sat.) ... 7210-ko. c.w.

Saturday and Sunday (excepting dates of official ARRL activities)

Saturday: Midnight–1:00 A.M. (Sun.) ....................................... 3555-ko. c.w.
Sunday: 11:00 A.M.–2:30 P.M. ........................................... 7210-ko. c.w.
6:00 P.M.–7:00 P.M. .......... 3850-4000-ko. voice
7:00 P.M.–8:00 P.M. .......... 7210-ko. c.w.

The station staff:

B. H. Newkirk, W8BBD, "rodi"
T. F. McMullen, jr., W8YCK, "fm"

WIAW is not open on national holidays.

*Traffic schedules are kept during this period.

BRIEF

The call W8PUN, Ohio PAM, was inadvertently omitted from the list of policing-observing stations who assisted in the clearing of frequencies during the September hurricane emergency as described in December 1947 QST.

CODE-PROFICIENCY CERTIFICATES

The ARRL Code Proficiency Program provides the opportunity for you to increase your code-copying ability. Special code-practice transmissions are made each evening, Monday through Friday, at 10:00 P.M. EST, from Headquarters Station W1AW. See the WIAW schedule on this page for details on frequencies and speeds.

Once each month special transmissions are made to enable you to qualify for an ARRL Code Proficiency Certificate. The next such qualifying run will be made on January 19th at 10:00 P.M. EST. Identical texts will be transmitted simultaneously from W1AW and W6CO of Wayzata, Minnesota. Frequencies of transmission from W6CO will be 7053 kc. and 3534 kc. W1AW will transmit on the same frequencies as those used for code practice. Either station may be copied. Send your copies of the qualifying run to ARRL for grading, indicating whether you copied W6CO or W1AW. If you qualify, you will receive a certificate. If your initial qualification is for a speed below 35 w.p.m. you may try later for endorsement stickers indicating progress above the first certified speed.

References to texts used on several of the practice transmissions are given below. These make it possible to check your copy.

A.R.R.L. ACTIVITIES CALENDAR

Jan. 17th: V.H.F. Sweepstakes
Jan. 19th: CP Qualifying Run
Jan. 23rd: Frequency-Measuring Test
Jan. 24th-25th: ARRL-Member Party
Feb. 13th-16th: DX Competition (c.w.)
Feb. 19th: CP Qualifying Run
Feb. 20th-23rd: DX Competition (phone)
Mar. 12th-15th, DX Competition (c.w.)
Mar. 17th: CP Qualifying Run
Mar. 19th-22nd: DX Competition (phone)
Apr. 12th, May 14th: CP Qualifying Runs
April 24th-25th: CD QSO Party
June 12th-13th: ARRL Field Day

Jan. 1st-Dec. 31st: Most-States V.H.F.

First Saturday night each month: ARRL Officials Nite (Get-together for SCMs, RMs, SECs, ECs, PAMs. Hq. Staff, Directors, Alt. and Asst. Dirs.)

January 1948

75


**TRAFFIC TOPICS**

There has been some confusion with the signals QSV, "Send a series of Vs," and QRV, "I am ready." We might suggest that during lulls in net operation, it would be helpful to practise using the net QN signals and other Q signals that apply to net operation.

Trunk Line L is in operation on 3615 kc., Monday through Friday, at 10:00 P.M. EST. TLL will be a transcon, when filled with necessary stations, and now takes traffic for New York, Pennsylvania, Ohio, Indiana, Illinois and Missouri. The trunk manager is W2ITX.

The East Pa. Traffic Net is meeting at 6:30 P.M. EST, Monday through Friday, on 3785 kc. New stations are needed for greater coverage. Contact W3GMK, net manager.

The Veterans Administration hospitals in the Kentucky area have a fine traffic outlet through the Kentucky nets, KYN and KYP, according to information received from W4BAZ, RM for Kentucky.

W4VP and W7KAJ/6 are attempting to form a net of stations located in the veterans rehabilitation hospitals. Anyone in these hospitals who would like to participate should contact either of these men.

National Trunk Line is back on the air on 3670 kc. at 9:00 P.M. EST, Monday through Friday, with a second period at 11:00 P.M. EST. W1AW is net control station. The NTL connects all operating trunk lines for traffic exchange.

The Pine Tree Net up in the Maine country is operating on 3550 kc. at 7:00 P.M. EST, Monday through Friday. The PTN has connections into TLC, NEN, and VE1, 2, 3.

The Alberta Net is now in the organizational stage and is looking for members. All stations in that province, who might be interested, are requested to contact VE6LQ.

The Minnesota State Net (c.w.), MSN, is operating Monday through Saturday on 3795 kc. at 7:00 P.M. CST. The Minnesota State Net (phone), MSN, is operating on 3900 kc. at 6:15 P.M. CST, Monday through Saturday, and at 9:00 A.M. CST Sundays.

Trunk Line J has been in operation with a direct connection from Wisconsin to Florida. The trunk operates on 3780 kc. at 7:00 P.M. CST, Tuesday, Thursday, and Saturday, and will assume a full five-day schedule soon.

The North Texas Traffic Net is operating Monday, Wednesday and Friday on 3637.5 kc. at 8:00 P.M. CST. This net is a combined traffic and emergency group.

Iowa 75 'Phone Net is operating at 12:30 P.M. CST, Monday through Saturday, on 3970 kc. The net has good coverage throughout the state and ties in with the Iowa National Guard during emergency.

The North Carolina Net is in full swing on 3605 kc. with W4CYB as NCS. The net meets at 7:30 P.M. EST, Monday through Friday. All North Carolina amateurs are cordially invited to join.

The Ontario Fone Net is operating nightly, Monday through Friday, at 7:00 P.M. EST, on 3880 kc.

**SUPPLEMENT TO DIRECTORY OF ACTIVE NETS**

This listing is to be added to the directory as published in November 1947 QST. Supplements will be published at intervals to keep the directory up to date on all net listings and changes.

Beaver Net 3335 7:00 P.M. EST Mon.-Fri.
Buckeye Net (Ohio)* 3370 7:30 P.M. EST Mon.-Fri.
Cracker Emer. Net (Ga.) 3055 Wed. & Sun.
Delta Fone Net 3055 7:30 A.M. CST Sun.
East Pa. Traffic Net 3755 6:30, 7:30 P.M. EST Mon.-Fri.
Eastern Mass. Net 3745 7:00 P.M. EST Mon.-Fri.
Florida Emergency Net 2973
ILN (Illinois) 3755 6:15 A.M. CST Mon.-Fri.
Indiana C.W. Net 3655 6:30 A.M. CST Mon.-Fri.
Indiana Fone Net 3605 6:30 A.M. EST Tues. Thurs.
Iowa 75 'Phone Net 3970 12:30 P.M. EST Mon.-Sat.
Kansas Traffic Net 3810 6:45 P.M. CST Mon., Wed., Fri.
KYN (Kentucky) 3810 9:30 P.M. CST Mon., Wed., Fri.
The October CD QSO Party was one of the liveliest such activities on record. Observation during the shindig indicated that the gang was really going to town, but the number of high scores that turned up at Headquarters following the week-end of October 27th simply amazed us! Totals of more than 200,000 points were made by 41 participants. Favorable transmission conditions prevailing during the party helped considerably in making possible such high scores.

Top position was snagged again by W4KFC. Vic took just 2 hours and 14 minutes to make the first 100 contacts; his first hour of operation netted 47 QSOs and the second 45! Worthy of note is the average of 21.6 QSOs per hour he maintained during the entire 20 hours on the air. W8ROX, a consistent high scorer in the last few parties, took a well-deserved second place. W4IA, who needs no introduction to many record-breaking scores. Don’t miss it!

Here’s the shack of George Sangrik, W8ROX, ORS and second-high in the October CD QSO Party. His transmitter consists of a Meissner Signal Shifter and p.p. 250THs running at 250 watts input. Receiver is an NC-200. George is hard at work on a p.p. 250TH amplifier for use in future CD Parties! W8ROX also holds WAS, WAC, 35-w.p.m. Code Proficiency Certificate and is a member of the ASC and RCC.

January 1948

77
A.E.C. ASSISTS AT BOAT RACES

The Boulder City Emergency Corps, under the leadership of W7OPP, EC of Boulder City, Nev., furnished communications for the Second Annual Lake Mead Sweepstakes, September 27th and 28th. The Sweepstakes, an annual power-boat race on Lake Mead, sponsored by the American Power Boat Association and the Boulder City Junior Chamber of Commerce, comprised 28 races this year, and, in the limited time allowed for the running of each event, amateur radio proved of great value to the officials.

Hanley, W7OOR (left), and Wilson, W7OPP, at the boat pit, operating portable on 235 Mc. during the Second Annual Lake Mead Sweepstakes.

Six portable transmitters were used on 235 Mc., three of which were installed in crash boats located along the race course, one in the judges' stand, and one at the boat pit. At the boat pit another rig on 3.5 Mc. was used to supply communication with Boulder City. The race officials found the convenience of radio communication a big help in smoothly running off the numerous events.

It appears that this event will provide a yearly workout for the Boulder City AEC group as it offers an opportunity to render a public service as well as a chance to test emergency equipment. The following amateurs took part in the activity: W7JU, W7HJZ, W7JLN, W7LGS, W7OOR, W7OPP, W7SXD and W7TKV.

FREQUENCY-MEASURING TEST
January 23rd

W1AW will transmit signals for purposes of frequency measurement on 3.5, 7, 14 and 28 Mc, starting at 9:30 p.m. EST (6:30 p.m. PST), Friday evening, January 23rd. The signals will consist of dashes interspersed with station identification. They will follow a general message sent to enable listeners to locate the signals before the measurement transmission starts. The approximate frequencies used will be 3760, 7085, 14,310 and 28,010 kc. About 4½ minutes will be allowed for measuring each frequency, with long dashes for measurement starting about 9:36 p.m. It is suggested that frequencies be measured in the order listed. Transmissions will be found within 5 or 10 kc. of the suggested frequencies.

At midnight EST (9:00 p.m. PST) W1AW will transmit a second series of signals for the Frequency Measuring Test. The identifying procedure and recommended order of measurement will be the same as for the first test. Approximate frequencies used will be 3640, 7140, 14,395 and 28,030 kc.

Individual reports on results will be sent ARRL members who take part. Copies of this report are sent SCMs so eligibility for 00 appointments is known to the SCM. When the average accuracy reported shows errors less than 71.43 parts per million, or falling between limits of 71.43 and 357.15 parts per million, the participants will become eligible for appointment by SCMs as Class I or Class II Official Observers, respectively. It is only necessary that the individual amateurs have the interest and other qualifications for carrying forward in such League organization posts.

This ARRL Frequency Measuring Test will be used to aid qualification of Class I and Class II Observers. Observers not demonstrating the requisite average accuracy will lose their appointments until they demonstrate the above-stated minimum required accuracy for these classes of the appointment. It is required that all Class I and Class II OOs participate in at least two of the Frequency Measuring Tests to be announced during 1948.

Awards

All League members (and only members) who take part and who are not connected with the Official Observing system, will compete for an electric-clock award by submitting their best measurements on the FMT. It will be presented to the member whose readings show the highest accuracy. A second electric-clock award will be presented to the leading Class I Official Observer. To be considered for the clock award it is necessary to attach a statement that you, alone, as operator, handled your equipment in making the readings submitted to the Communications Department of the League.

All participants may submit frequency measurements on one or all frequencies listed above, all awards depending on the over-all accuracy, as compared with readings submitted by an independent professional frequency-measuring organization. An award committee will examine results to insure fairness to all, and its decisions shall be final.
DX CENTURY CLUB

Since the institution of the new DXCC listing many comments, pro and con, have been received. It is expected that a complete listing of all members, including scores, will be published periodically. The first complete list is tentatively scheduled for April QST. Send your additional cards for checking as soon as possible, so the list may be as complete as possible.

Applications for DXCC are rapidly increasing. At publication time, certificate Number 81 had been issued.

Complete mimeographed lists and rules can be had by writing or radioing to ARRL Training Aids. Our aids now include films, film strips, slides, records, recorders, keyers, tapes, reviews and sundry mimeographed and printed material.

Work is progressing on some original film strips and slide collections. New code tapes will be added as needed. Film reviews will be continued in the near future. We would like to hear from clubs with ideas.

DX CENTURY CLUB AWARDS

DXCC certificates based on wartime contacts with 100-or-more countries have been made to the amateurs listed below. The country-worked totals indicated have been certified by examination of written evidence under the award rules as published in March 1947 QST.

HONOR ROLL

<table>
<thead>
<tr>
<th>Call</th>
<th>Total</th>
<th>Call</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIFH</td>
<td>173</td>
<td>W3BXC</td>
<td>144</td>
</tr>
<tr>
<td>WSHGW</td>
<td>161</td>
<td>WICH</td>
<td>141</td>
</tr>
<tr>
<td>W3BCO</td>
<td>156</td>
<td>WTTW</td>
<td>141</td>
</tr>
<tr>
<td>W3DE</td>
<td>147</td>
<td>WIAAXA</td>
<td>140</td>
</tr>
<tr>
<td>WSRDZ</td>
<td>143</td>
<td>W2SGW</td>
<td>131</td>
</tr>
</tbody>
</table>

NEW MEMBERS

<table>
<thead>
<tr>
<th>Call</th>
<th>Total</th>
<th>Call</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W3BU</td>
<td>120</td>
<td>W3BXT</td>
<td>100</td>
</tr>
<tr>
<td>NY4CM</td>
<td>114</td>
<td>W3BHD</td>
<td>100</td>
</tr>
<tr>
<td>W3DRD</td>
<td>104</td>
<td>GSKP</td>
<td>100</td>
</tr>
<tr>
<td>W6SR</td>
<td>104</td>
<td>YSVU</td>
<td>100</td>
</tr>
<tr>
<td>W3BCO</td>
<td>103</td>
<td>WSGS</td>
<td>100</td>
</tr>
<tr>
<td>W4DKA</td>
<td>103</td>
<td>W3SN</td>
<td>100</td>
</tr>
<tr>
<td>W3TP</td>
<td>103</td>
<td>WSTL</td>
<td>100</td>
</tr>
<tr>
<td>W9NTA</td>
<td>102</td>
<td>W3FAX</td>
<td>100</td>
</tr>
<tr>
<td>W9KOK</td>
<td>101</td>
<td>W9RJU</td>
<td>100</td>
</tr>
<tr>
<td>WSRVY</td>
<td>101</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ENDORSEMENTS

<table>
<thead>
<tr>
<th>Call</th>
<th>Total</th>
<th>Call</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W2AX</td>
<td>123</td>
<td>W3ET</td>
<td>116</td>
</tr>
<tr>
<td>W2GUM</td>
<td>121</td>
<td>W3RJ</td>
<td>112</td>
</tr>
<tr>
<td>W5ASC</td>
<td>121</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RADIO TELEPHONE

<table>
<thead>
<tr>
<th>Call</th>
<th>Total</th>
<th>Call</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIFH</td>
<td>128</td>
<td>W2ZW</td>
<td>102</td>
</tr>
<tr>
<td>WIKE</td>
<td>110</td>
<td>W1ICX</td>
<td>100</td>
</tr>
<tr>
<td>W4CTU</td>
<td>109</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TRAINING AIDS

Code Lessons on Tape. Responsive to demand, the code lessons which appear in the rear pages of the ARRL booklets "Learning the Radiotelegraph Code have been put on paper tape suitable for use on any inked-tape type keyer, such as the TG-10. These tapes are available for use of affiliated clubs (with or without keyer) on a temporary loan basis. The code lessons are also available in mimeographed form if desired.

Code Training AIDS. The list below includes all code-proficiency equipment and material which can be borrowed by affiliated clubs by appropriate application. Drop us a line for complete rules and application forms.

Code Records (75 w.p.m.):

<table>
<thead>
<tr>
<th>Call</th>
<th>Total</th>
<th>Call</th>
<th>Total</th>
</tr>
</thead>
</table>
| T2A | album | T2A | album | BRIEF

The Illinois Central Railroad has awarded gold medals to W5EWD, W5FCH and W5NRW for meritorious service during the September 1947 hurricane which struck Mississippi. These amateurs handled the entire volume of the railroad's train orders between I.C.R.R. division headquarters at McComb, Miss., New Orleans, and Baton Rouge, La. W5NRW is a train dispatcher for the I.C.R.R.

With Code Proficiency copies arriving at Hq. each month following the qualifying run we usually receive several notes expressing thanks for the practice transmissions made from W1AW each weekday evening. One such note recently received points out what are perhaps two of the most important advantages of these transmissions. A former commercial op, brushing up on his code speed, writes, "After copying W1AW, I can say there is more real practice in ten minutes of c.w. on amateur frequencies than there is in hours of copying interference-free S9 commercial signals." The W1AW practice transmissions, or any other clean-cut sending at suitable speeds in the amateur bands, provide excellent practice not merely in copying code, but in coping through varying degrees of interference and at various signal-strength levels — the best practical experience for any kind of radio operating.

January 1948

Recorders and Keyers:

T2A Recorder, McBey SR900 SL900. Audio tone input and tape puller are necessary auxiliaries. Records code signals on 5/6" white paper tape.

T2A. Tape puller, to accompany T2A if required.

T2A. Keyer, TG-10. Produces keyed audio tone from inked paper tape. Speed dial calibrated in feet-per-minute and w.p.m. calibration useful only when ARRL "calibrated" tapes are used (see "TP" items below).

T3A. Recorder, HC-1016. Records code signals on 5/6" white paper tape. No tape puller or audio tone required.

Tapes:

TP1. W1AW code practice, inked copy, calibrated.

TP2. Code groups, scrambled text, plain text with punctuation. Inked tape, calibrated.

TP3. Old W1AW qualifying run, inked copy, calibrated.

TP4. W1AW code practice, inked copy, recorded for slow speeds (below 9 w.p.m.) on T25

TP5. Same as TP2, but recorded for speeds below 9 w.p.m. on T25.

TP6. Kleinenschmidt perforated tape, W1AW code practice. This tape cannot be used on T25.


TP8. Same as TP7, Lessons 4 and 5.

TP9 Same as TP7. Lessons 6, 7, 8 and 9.

The list below includes all amateurs listed below. The countries-worked totals indicated have been certified by examination of written evidence under the award rules as published in March 1947 QST.
ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — The York Road Radio Club held a very successful banquet at which there were many prizes for the lucky winners and plenty to eat. Rumor hath it that bloodhound will be standard equipment in the 144-Mc. transmitter hunts held by the YRRC. KT now is W3 QSL Manager and is being helped in his work by members of the Frankford Radio Club. The FRC and the Coventry Amateur Radio Society have been holding over-the-air joint club meetings which are being received with great enthusiasm on both sides of the Atlantic. They believe that this is the first such venture. HBY nearly had to leave his happy home. It seems that he put his beam right through his roof for convenience in rotating from his shack in the attic and was not careful in making it water tight. The rains came and water ran down the pipe and on the top side of the ceiling of the room where HBY junior sleeps. The most convenient hole for the water to run out was the one where the electrical fixture was hung, the said fixture being in the inverted bowl type supported by three chains. These chains were designed to hold the bowl only, and no allowance was made for the couple of quart of rain water. You probably have guessed the rest. The chain broke and at 3 o'clock in the morning spilled a lot of very chilly water into the face of HBY junior.

Let it be a lesson. NNY now has his BC-610 perking on 28, 304 kc. The Schuykill ARC will get the use of a recorder and tape machine from ARRL GHD's beam atop his 60-foot mast is working super DX on 14 Mc. DZ had a time in the turn out at the ITC Conference in Atlantic City. TKO ill seeking a new Jr. operator. CongratS, OM.

MARYLAND-DELAVARE-DISTRICT OF COLUMBIA — SCM, Eppa W. Darne, W3BWT — The Washington Area Emergency Corps, under the leadership of BIS, Area Coordinating, is to be congratulated on its splendid performance during the Simulated Emergency Test, Oct. 12. The Washington Radio Club's first October meeting was "Receiver Night." Four speakers, Messrs. McGehon, Emerson, Maiden, and Young gave good lectures and answered all the gang's questions. The second October meeting featured an equipment auction in which much apparatus and surplus rig for emergency work. OFB also desired by SCM's for inclusion in their equipment is being assisted in his work by members of the Frankford Radio Club. The FRC and the Coventry Amateur Radio Society have been holding over-the-air joint club meetings which are being received with great enthusiasm on both sides of the Atlantic. They believe that this is the first such venture. HBY nearly had to leave his happy home. It seems that he put his beam right through his roof for convenience in rotating from his shack in the attic and was not careful in making it water tight. The rains came and water ran down the pipe and on the top side of the ceiling of the room where HBY junior sleeps. The most convenient hole for the water to run out was the one where the electrical fixture was hung, the said fixture being in the inverted bowl type supported by three chains. These chains were designed to hold the bowl only, and no allowance was made for the couple of quart of rain water. You probably have guessed the rest. The chain broke and at 3 o'clock in the morning spilled a lot of very chilly water into the face of HBY junior.

Let it be a lesson. NNY now has his BC-610 perking on 28, 304 kc. The Schuykill ARCS will get the use of a recorder and tape machine from ARRL GHD's beam atop his 60-foot mast is working super DX on 14 Mc. DZ had a time in the turn out at the ITC Conference in Atlantic City. TKO ill seeking a new Jr. operator. CongratS, OM.

SOUTHERN NEW JERSEY — SCM, G. W. (Bill) Tunnell, W20XX — W2Is home from the hospital and will operate a bedside rig while recuperating. SAH has a war surplus rig for emergency work. CF3 is back on the air. 3NF/2 is ORS in Phillipsburg and schedules his brother, 8MEG, on 3NF/2 is ORS in Phillipsburg and schedules his brother, 8MEG, for a job well done in the emergency work. OFB also desired by SCM's for inclusion in their equipment is being assisted in his work by members of the Frankford Radio Club. The FRC and the Coventry Amateur Radio Society have been holding over-the-air joint club meetings which are being received with great enthusiasm on both sides of the Atlantic. They believe that this is the first such venture. HBY nearly had to leave his happy home. It seems that he put his beam right through his roof for convenience in rotating from his shack in the attic and was not careful in making it water tight. The rains came and water ran down the pipe and on the top side of the ceiling of the room where HBY junior sleeps. The most convenient hole for the water to run out was the one where the electrical fixture was hung, the said fixture being in the inverted bowl type supported by three chains. These chains were designed to hold the bowl only, and no allowance was made for the couple of quart of rain water. You probably have guessed the rest. The chain broke and at 3 o'clock in the morning spilled a lot of very chilly water into the face of HBY junior.

Let it be a lesson. NNY now has his BC-610 perking on 28, 304 kc. The Schuykill ARCS will get the use of a recorder and tape machine from ARRL GHD's beam atop his 60-foot mast is working super DX on 14 Mc. DZ had a time in the turn out at the ITC Conference in Atlantic City. TKO ill seeking a new Jr. operator. CongratS, OM.

W20XX — W2Is home from the hospital and will operate a bedside rig while recuperating. SAH has a war surplus rig for emergency work. CF3 is back on the air. 3NF/2 is ORS in Phillipsburg and schedules his brother, 8MEG, for a job well done in the emergency work. OFB also desired by SCM's for inclusion in their equipment is being assisted in his work by members of the Frankford Radio Club. The FRC and the Coventry Amateur Radio Society have been holding over-the-air joint club meetings which are being received with great enthusiasm on both sides of the Atlantic. They believe that this is the first such venture. HBY nearly had to leave his happy home. It seems that he put his beam right through his roof for convenience in rotating from his shack in the attic and was not careful in making it water tight. The rains came and water ran down the pipe and on the top side of the ceiling of the room where HBY junior sleeps. The most convenient hole for the water to run out was the one where the electrical fixture was hung, the said fixture being in the inverted bowl type supported by three chains. These chains were designed to hold the bowl only, and no allowance was made for the couple of quart of rain water. You probably have guessed the rest. The chain broke and at 3 o'clock in the morning spilled a lot of very chilly water into the face of HBY junior.

Let it be a lesson. NNY now has his BC-610 perking on 28, 304 kc. The Schuykill ARCS will get the use of a recorder and tape machine from ARRL GHD's beam atop his 60-foot mast is working super DX on 14 Mc. DZ had a time in the turn out at the ITC Conference in Atlantic City. TKO ill seeking a new Jr. operator. CongratS, OM.

SOUTHERN NEW JERSEY — SCM, G. W. (Bill) Tunnell, W20XX — W2Is home from the hospital and will operate a bedside rig while recuperating. SAH has a war surplus rig for emergency work. CF3 is back on the air. 3NF/2 is ORS in Phillipsburg and schedules his brother, 8MEG, for a job well done in the emergency work. OFB also desired by SCM's for inclusion in their equipment is being assisted in his work by members of the Frankford Radio Club. The FRC and the Coventry Amateur Radio Society have been holding over-the-air joint club meetings which are being received with great enthusiasm on both sides of the Atlantic. They believe that this is the first such venture. HBY nearly had to leave his happy home. It seems that he put his beam right through his roof for convenience in rotating from his shack in the attic and was not careful in making it water tight. The rains came and water ran down the pipe and on the top side of the ceiling of the room where HBY junior sleeps. The most convenient hole for the water to run out was the one where the electrical fixture was hung, the said fixture being in the inverted bowl type supported by three chains. These chains were designed to hold the bowl only, and no allowance was made for the couple of quart of rain water. You probably have guessed the rest. The chain broke and at 3 o'clock in the morning spilled a lot of very chilly water into the face of HBY junior.

Let it be a lesson. NNY now has his BC-610 perking on 28, 304 kc. The Schuykill ARCS will get the use of a recorder and tape machine from ARRL GHD's beam atop his 60-foot mast is working super DX on 14 Mc. DZ had a time in the turn out at the ITC Conference in Atlantic City. TKO ill seeking a new Jr. operator. CongratS, OM.

W20XX — W2Is home from the hospital and will operate a bedside rig while recuperating. SAH has a war surplus rig for emergency work. CF3 is back on the air. 3NF/2 is ORS in Phillipsburg and schedules his brother, 8MEG, for a job well done in the emergency work. OFB also desired by SCM's for inclusion in their equipment is being assisted in his work by members of the Frankford Radio Club. The FRC and the Coventry Amateur Radio Society have been holding over-the-air joint club meetings which are being received with great enthusiasm on both sides of the Atlantic. They believe that this is the first such venture. HBY nearly had to leave his happy home. It seems that he put his beam right through his roof for convenience in rotating from his shack in the attic and was not careful in making it water tight. The rains came and water ran down the pipe and on the top side of the ceiling of the room where HBY junior sleeps. The most convenient hole for the water to run out was the one where the electrical fixture was hung, the said fixture being in the inverted bowl type supported by three chains. These chains were designed to hold the bowl only, and no allowance was made for the couple of quart of rain water. You probably have guessed the rest. The chain broke and at 3 o'clock in the morning spilled a lot of very chilly water into the face of HBY junior.

Let it be a lesson. NNY now has his BC-610 perking on 28, 304 kc. The Schuykill ARCS will get the use of a recorder and tape machine from ARRL GHD's beam atop his 60-foot mast is working super DX on 14 Mc. DZ had a time in the turn out at the ITC Conference in Atlantic City. TKO ill seeking a new Jr. operator. CongratS, OM.
Merry Christmas

AND

Happy New Year

FROM NATIONAL COMPANY WHICH INCLUDES

C. L. Gagnebin ............... W1ATD
Herman S. Bradley .......... W1BAQ
James Ciarlone ............. W1BH
Lawrence Amann ............ W1BG
Allen King .................. W1CJL
Calvin Hadlock ............. W1CTW
Harvey Poore ............... W1DKM
Seth Card ................... W1DRO
Harry Gardner .............. W1EHT
J. Francis Bartlett ......... W1EU
William Osborne .......... W1EXR
George R. Ringland ......... W1BZ
Don Hinds .................. W1FRZ
Robert Murray .............. W1FSN
Barton Mitchener........... W1GNV
Dave Smith .................. W1HOH
John Baxter .................. W1HRK
Vincent Messina .......... W1HRW
Jack Ivers .................. W1HSV
Edmund Harrington ......... W1JEL
Alfred Zerega .............. W1JM
Robert Williams ............ W1JOX
Frank Lopez ................ W1KPB
Harold Gould ............... W1KWW
Richard L. Gentry ......... W1LEN
John Stanley ............... W1LFF
Leo Green .................. W1IML
Francis Waden ............. W1IN
Richard Thurston .......... W1MEZ
Frank Nault .............. W1MK
Victor Penney ............. W1MTS
Donald Poulin ............. W1MXC
Dexter Atkinson .......... W1MYH
Martin Oxman .............. W1NYU
Ralph Hawkins .......... W1OEX
John Prusak ............... W1OPT
William McNamara ......... W1OTK
William Bartell ........... W1PIJ
Charles Coyle .......... W1PME
Harry Paul .............. W1PMS
Harry Harris ........... W1PFF
Hyman Kana .............. W1PSJ
S. W. Bateman ........ W1RX
Leo Green .................. W1IML
Francis Waden .......... W1IN
Richard Thurston ....... W1MEZ
Frank Nault ........ W1MK
Victor Penney .... W1MTS
Donald Poulin .. W1MXC
Dexter Atkinson .. W1MYH
Martin Oxman .. W1NYU
Ralph Hawkins .. W1OEX
John Prusak .. W1OPT
William McNamara .. W1OTK
William Bartell .. W1PIJ
Charles Coyle .. W1PME
Harry Paul .. W1PMS
Harry Harris .. W1PFF
Hyman Kana .. W1PSJ
S. W. Bateman .. W1RX

* For many years it was our custom each year to buy National Tuberculosis Society Christmas Seals and have our QST stick one on this page in each copy of the January issue. But this year, like the last couple of years, there seem to be more important jobs for girls to do than licking 97,000 stamps! We are making our contribution in the same amount as if we had bought the Christmas Seals, and the printed reproduction above is a symbol of the stamp we wish were there.
wood, and Manor have joined this bang-up club. An invitation also is extended to those interested in attending. YDJ sends in some juicy items. The 3.5-Mc. AEC registrants in Pittsburgh are organizing a practice net with Sunday morning drills. Poolcat Net operation is on 3090 kHz. MGB and TQF are trying with 144 Mc. DLG and UHN are using Sonar mobile n.f.m. In cars on 28 Mc. MGB has Milen VHF exciter. LGM is VFO on 28 Mc. GEG and LQJ are new ORS. KEW is rebuilding to Tabletop kw. LQJ is KQL in Michigan. CB is tickled to work VR QSL, MLN and HWF made new 244-mile record on his 28-Mc. transmitter. Alexeit leased a 85-ft. tower on the Prefab line and is looking for contacts. EBX has worked his 130th country. LNM has new 240 watts to a new HY5IA final. RSE is running 240 watts to a new HY5IA final. RSE is running 240 watts to a new HY5IA final.

CENTRAL DIVISION

I LlINOIS - SCM, Wesley E. Marriago, W9ABD - From DFT we learn that the Western Illinois Club at Amboy elected TMI, prof.; AEX, vice-prof.; GQR, secy.; KDO, treas. A picnic was held at Alexeit's camp on Oct. 12th. IFUX, of Beardstown, is back in the air for some band-up action. His frequency is 7110 kc. Members of the Illinois Valley Radio Association are: OBB, HIK, LQG, PSY, WO9, ZNB, OLM, WW9, FQR, ACJ, IYJ, DLY, DLO, OWJ, CVY, DLY, PBY, BSG, and RNR. FNR is looking for QSLs. FJI is back with 400 watts to a pair of 755s on 3.85 Mc. WHB has joined the Silent Keys. The CQ Club has changed its name to the Lake County Amateur Radio Club. New officers are: QCY, prof.; ABY, vice-prof.; BGR, secy. and JMR, treas. A successful picnic on Blue Mounds. FTG and Bismarck.

The Illinois Valley Radio Association are: OBB, HIK, LQG, PSY, WO9, ZNB, OLM, WW9, FQR, ACJ, IYJ, DLY, DLO, OWJ, CVY, DLY, PBY, BSG, and RNR. FNR is looking for QSLs. FJI is back with 400 watts to a pair of 755s on 3.85 Mc. WHB has joined the Silent Keys. The CQ Club has changed its name to the Lake County Amateur Radio Club. New officers are: QCY, prof.; ABY, vice-prof.; BGR, secy. and JMR, treas. A successful picnic on Blue Mounds. FTG and Bismarck.
Entirely New Design now brings you

**NEW FLEXIBILITY, NEW BEAUTY, NEW LOW COST**

The CENTURY series heralds a new era of brilliantly engineered and superbly styled low-cost microphones. Designed for utmost flexibility, it is available in a choice of three generating elements: crystal, dynamic, or carbon. Each provides excellent reproduction and high output. Each gives you exclusive E-V quality features. Each is top value!

Size is 3\"x2\"x1.5\". Crystal model weighs only 6 ounces. Highest purity diecast metal case, finished in lustrous gray-brown. The incomparable CENTURY can be used in a variety of ways, as shown. It is the perfect answer for all economical installations. Get full details now! Send for Bulletin No. 137.

**NEW CENTURY**

**CRYSTAL, DYNAMIC, CARBON MICROPHONES**

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Output</th>
<th>Freq. Resp.</th>
<th>Cable</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>915</td>
<td>Crystal</td>
<td>-50</td>
<td>60-7200</td>
<td>7½ ft</td>
<td>$10.00</td>
</tr>
<tr>
<td>915-S</td>
<td>Crystal</td>
<td>-50</td>
<td>60-7200</td>
<td>7½ ft</td>
<td>$10.00</td>
</tr>
<tr>
<td>615</td>
<td>Dynamic</td>
<td>-57</td>
<td>55-7500</td>
<td>7½ ft</td>
<td>$16.50</td>
</tr>
<tr>
<td>415-S</td>
<td>Dynamic</td>
<td>-57</td>
<td>55-7500</td>
<td>7½ ft</td>
<td>$18.00</td>
</tr>
<tr>
<td>615-55</td>
<td>Dynamic</td>
<td>-57</td>
<td>55-7500</td>
<td>7½ ft</td>
<td>$20.00</td>
</tr>
<tr>
<td>615-55</td>
<td>Carbon</td>
<td>-26</td>
<td>200-4000</td>
<td>48 in</td>
<td>$7.75</td>
</tr>
<tr>
<td>215-55</td>
<td>Carbon</td>
<td>-26</td>
<td>200-4000</td>
<td>48 in</td>
<td>$10.00</td>
</tr>
</tbody>
</table>

*with slide-to-talk shorting switch
**with slide-to-talk relay control switch and hang-up hook using input transformer

Model 415. New, modern, reclining Desk Stand. Microphone mounts at 15\° tilt. List Price $1.50

Model 330. Suspension Bracket, Fits 5/8\"-27 thread adapter. List Price .................. $ .55

Authorized Distributors Everywhere

**NO FINER CHOICE THAN E**

Arkansas - SCM, Marshall Riggs, W5JCC - The State is making good progress in securing emergency equipment, with JAP having 3.5-kw. generator along with the other to go with it. EA has fully equipped BC-654A in operation. MRD has two complete BC-654As. DSW and BHJ have the BC-654A in operation also. LUY has new final p.p. 8128, 400 watts, on 14 and 7 Me. RHY is operating from 4TIS at Fort Benning, Ga. FHP now is KL7MH on 14 and 7 Me. locating for Minnesota contacts. SW has a new 28- and 14-Mc. beam atop a 60-tol foot tower. BHY is building a frequency amplifier and an antenna coupler. BGY is operating from Cromwell and has joined MBN. BMX has changed his OBS schedule to 500 a.m. Mondays and Wednesdays. 6SHF now is 6DFS, DNT is arranging for every active ham. You do not have to be Class A to hold those appointments. Get in touch with the SCM. MAD will have new QTH somewhere in the Pacific area. His XYL, MAE, will go to Houston. Traffic: W5KTE 104, GHP 39, VT 19, CEW 7, KHC 8.

Mississippi - SCM, Harold Day, W5GW - PAM: LN, RM, WM, CS. IHM, and GCM have FT-102 rigs. BSR is active on Delta 75 and Tri-State Emergency Nets. QH, CNG, CGC, IKJ, 1JW, and others are active around Shreveport and Bossier. KIX is on 3550 kc., with a well equipped St. BMX, on crossband using 144 Mc., for transmitter and 50 Mc., for receiver. PHR, program director of the SFARC, arranges programs for each weekly meeting. Thus far, DRT, RNY, NMA, and ZRA have given talks. The SFARC is preparing to install a 1500-watt emergency generator. The club and ZRA have given talks. The SFARC and ZRA have visited part of the Rapid City gang in person and part via 28 Mc. through courtesy of ADJ. SDE, GCP, HDO, and others put on an ARRL program over KMIR at Mitchell during KH2's 'phone week. The 144-Mc. observations are on 28 Mc. in states that are NET for Argonauts, W0GZD 21, SSW 13.

Minnesota- SCM, Walter G. Hasskamp, W5CWB - AQU is operating from 4TIS at Fort Benning, Ga. FHP now is KL7MH on 14 and 7 Me. looking for Minnesota contacts. SW has a new 28- and 14-Mc. beam atop a 60-toul foot tower. BHY is building a frequency amplifier and an antenna coupler. BGY is operating from Cromwell and has joined MBN. BMX has changed his OBS schedule to 500 a.m. Mondays and Wednesdays. 6SHF now is 6DFS, DNT is arranging for every active ham. You do not have to be Class A to hold those appointments. Get in touch with the SCM. MAD will have new QTH somewhere in the Pacific area. His XYL, MAE, will go to Houston. Traffic: W5KTE 104, GHP 39, VT 19, CEW 7, KHC 8.
Here's an Eimac 4-65A that has been subject to a prolonged 1280% overload... look at it... a 65-watt tube that dissipated 900 watts before physical evidence of overload, and still no mechanical failure... in normal service it's still going strong.

PYROVAC... A NEW EIMAC PLATE MATERIAL

The story's out... Pyrovac, a new Eimac plate material, the culmination of ten years research and millions of hours of life test data, is now in standard production—at no extra cost.

Pyrovac is truly as important a milestone of vacuum tube development as the thoriated tungsten filament. Pyrovac plates, like the thoriated tungsten filament, open a new vista for vacuum tube life performance.

This new material combines the advantages of tantalum to overloads, molybdenum's strength, weight and conductivity, and carbon's ability to dissipate heat... with none of the disadvantages of these materials. Tubes with Pyrovac plates are mechanically rugged, require no additional getters and they do not gas even under extreme overloads.

The life span of tubes with Pyrovac plates far exceeds that of tubes incorporating plates of conventional materials. For example, under conditions where a tube gave 3000 hours of service, the same tube type with a Pyrovac plate gave 15,000 hours of life, a 400 percent increase!

Pyrovac plates are capable of handling overloads in excess of 1000%. For instance, the 4-65A plate pictured above was radiating 900 watts of heat... a 1280% overload... without indication that the eventual life of the tube or its characteristics were affected. We don't suggest you dissipate 900 watts of heat in your Eimac 4-65A's (you could probably do it), but this example establishes proof that Pyrovac is a superior plate material destined to become the anode standard of the vacuum tube industry.

Pyrovac plates were first incorporated in the Eimac 4-250A in the early part of 1946 and followed in the 4-125A. As a result there has been universal acceptance of these tubes in all fields of electronic endeavor... Further proof of the superiority of this new plate material. In the ensuing period of time all Eimac internal anode type tubes have been converted to Pyrovac plates as rapidly as production facilities would allow.

For your assurance to obtain the most in performance and satisfaction for your vacuum-tube-dollar, insist on Eimac tubes... the criterion of good design in any electronic equipment.

EITEL-McCULLOUGH, INC.
190 San Mateo Ave.
San Bruno, California
and MMV have Class A tickets. OGP and FJN are operating on all bands. FB is building a kilowatt for 28 and 50 Mc. Newspapers to the contrary, BAZ is not married. FB and CDA are building p.p. 813 amplifiers. The CKAR Club visited Lexington Signal Depot. Kentucky University’s ham club held a building meeting. Net was held on New Haven Haiti on 3.85 Mc. JX3W now is in Audubon Park, CJR, JPY, and YCC are on 3.85-Mc., phone with ANA, LTPQ, MP, and TUP on 3.5-Mc. e.w. DNI, KBY, MTB, and JTZ are on 14-Mc., phone. RT, RXN, JEB, JFB, OIF, MCF, and YI’S are operating on 144 Mc. YYV is attending Kentucky University. JYM is building 150-watt rig on 28-Mc. and is teaching at Western State where LQX is studying (?) and operating portable on 7 Mc. NGZ has new beam for 28 and 14 Mc. CMP is active mostly on Kentucky Phone Net, has new e.o. and 100-Kc. frequency standard. Traffic: W4BZ 149, CDA 30, FBJ 12, TJJ 11, KWO 4. MICHIGAN — SCOM, Joseph R. Beljan, Jr., W8SW — SEC: SAY, RM: NOH, PYF, and UYK. PYF is new RM and is manager of the 7 p.m. QMN Net. BCX is new ORS. Grand Rapids Radio Club election: EBI, pres.; ZCH, vice-pres.; AQA, secy.-treas.; and NOH, activities manager. NCLG has an eighteen-element beam on 144 Mc. VOD has new four-element beam and is working nice DX. SAAY worked G3SUB on 3.5 Mc. RLT is working choice DX on 50 Mc. TRN continues to schedule VEINNW with good success. Comments on joining a married rig: VOK will follow shortly. Congrat to WIT and WUW on the arrival of the jr. operator. TNO is doing a nice job as EC for the Pontiac area and reports increased activity on 144 Mc. TNO is helping with local hunts. YCL moved to Longview. EGI moved to new QTH when not QRL. DNM moved to new EBJ, and ZAU. IVC has been appointed ORS, and DXB and APC have been appointed OBS. The Buckeye Net got out of the hospital after a minor operation. TUX is back off to a good start on Oct. 15th, with 22 stations reporting RN’• appointment as Route Manager has been renewed. WBCYH 18, AQA 12. (Oct.) WBSAY 609, NOH 211, continues to do a nice job on the 5 P.M. Net. SAY is first of the hunters. YCL moved to Longview. EGI moved to new QTH the net include IVC, EBJ, ZAU, LT, and SJF. Stations are

HUNTER HUNT was won by Bob Kamp, with Roy Dieaelbers:

and MMM have Class A tickets. OGP and FJN are operating on all bands. FB is building a kilowatt for 28 and 50 Mc. Newspapers to the contrary, BAZ is not married. FB and CDA are building p.p. 813 amplifiers. The CKAR Club visited Lexington Signal Depot. Kentucky University’s ham club held a building meeting. Net was held on New Haven Haiti on 3.85 Mc. JX3W now is in Audubon Park, CJR, JPY, and YCC are on 3.85-Mc., phone with ANA, LTPQ, MP, and TUP on 3.5-Mc. e.w. DNI, KBY, MTB, and JTZ are on 14-Mc., phone. RT, RXN, JEB, JFB, OIF, MCF, and YI’S are operating on 144 Mc. CMP is active mostly on Kentucky Phone Net, has new e.o. and 100-Kc. frequency standard. Traffic: W4BZ 149, CDA 30, FBJ 12, TJJ 11, KWO 4. MICHIGAN — SCOM, Joseph R. Beljan, Jr., W8SW — SEC: SAY, RM: NOH, PYF, and UYK. PYF is new RM and is manager of the 7 p.m. QMN Net. BCX is new ORS. Grand Rapids Radio Club election: EBI, pres.; ZCH, vice-pres.; AQA, secy.-treas.; and NOH, activities manager. NCLG has an eighteen-element beam on 144 Mc. VOD has new four-element beam and is working nice DX. SAAY worked G3SUB on 3.5 Mc. RLT is working choice DX on 50 Mc. TRN continues to schedule VEINNW with good success. Comments on joining a married rig: VOK will follow shortly. Congrat to WIT and WUW on the arrival of the jr. operator. TNO is doing a nice job as EC for the Pontiac area and reports increased activity on 144 Mc. TNO is helping with local hunts. YCL moved to Longview. EGI moved to new QTH when not QRL. DNM moved to new EBJ, and ZAU. IVC has been appointed ORS, and DXB and APC have been appointed OBS. The Buckeye Net got out of the hospital after a minor operation. TUX is back off to a good start on Oct. 15th, with 22 stations reporting RN’• appointment as Route Manager has been renewed. WBCYH 18, AQA 12. (Oct.) WBSAY 609, NOH 211, continues to do a nice job on the 5 P.M. Net. SAY is first of the hunters. YCL moved to Longview. EGI moved to new QTH the net include IVC, EBJ, ZAU, LT, and SJF. Stations are

HUNTER HUNT was won by Bob Kamp, with Roy Dieaelbers:
FOR SALE — Miles continuous tape recorder, reproduction in good condition, 265, Delmont Schumman, 325 Nicollet Ave., Mankato, Minn.

WILL TRADE — National Radio School course. Want BC-854A transmitter and receiver or BC-348 receiver in good condition. Louis Hyman, 3757 Theodosia, St. Louis 12, Mo.

FOR SALE — Unmounted rock crystal for receivers, each one tested. Irwin O. Tilinski, 330 W. 11th Ave., Tarentum, Pa.

FOR SALE OR TRADE — Salesy direction indicator with transmitter, mechanical beam rotator. $15 or will trade for BC-659H FM transmitter in A-1 condition. A. E. Brown, 417 N. Orchard, Burbank, Calif.

FOR SALE — BC-645-A transmitter-receiver, new with 15 tubes, $19.95 ea.; also walkie-talkies complete with tubes and equipment. H. E. Leigh, 530 Birch St., Boulder City, Nev.

FOR SALE — For receivers, each one tested. Irwin C. Bauer, Ward 4, USVA Hospital, Outpatient Bldg., Woolwich, N. J.


FOR SALE — Triplett VOM 240G in excellent condition. $40. Michael Dudoros, Box 1608, Patterson, N. J.

WANTED — Converter, 10 meter mobile. Will trade or sell SX-32 Motorola PMAR135 fixed frequency mobile receiver, Hallafters S-20-R and National NTX-20 transmitter. B. F. Harris, 6748 N. Ashland Ave., Chicago 26, Ill.

FOR SALE — Supreme 517 signal generator available excellent condition. $50. Daniel Nuss, Downtown Radio & Electric, Box 51, Doylestown, Ohio.

SELL OR TRADE — HT74 Heath aircraft receiver. $25; BC-1300 less band generator, $15. Ralph Franklin, Box 801, Detroit 31, Mich.

FOR SALE — Stanco 10P transmitter complete with tubes, coils, crystals and microphone, used less than 10 hours, $45; also instrucligraphic coil machine with built-in oscillator and 10 tapes, $15. Clair A. Rupert, RD No. 1, Sandy Lake, Pa.

SELL OR TRADE — S-38 in perfect condition. Want SX-26 in good condition with or without speaker. William H. Bauer, Ward 4, USVA Hospital, Outwood, Ky.

FOR SALE — $5 issues Radio Jan. 36 to Jan. 41; $5.50-10 issues; $10-15 receiver, $20—40 radio-receiver, new 110 volt, 60 cycle, $90 or trade for 15 reel code practice tape kit for TC-10 automobile key, Ray Warner, W77W, 530 Birch St., Boulder City, Nev.

SELL OR TRADE — QST magazine, 1924-1948, BC-375E transmitter, American Radio Relay League unit for recording telegraphic signals, teleprinter, communications receiver. Write for list of ham gear. Want American and Canadian manufacturers’ name!

FOR SALE — Driver transformer Stan­
coe A-4712 and cathode modulation trans­
former Stanco A-3885, $5 plus postage. Charles M. Palmer, 1907 Roslan, Over­
land 21, Mo.

SELL OR TRADE — Converted BC-348P $50; unused TR-4; used DK-2 both with tubes. $60; Excellent BC-291 with bat­
teries, $40; SCR-522, Speco STAD, Su­
gro 502, ADF receiver, etc. Want Pan­adapt doorknob tracer or what have you! E. B. Page, Box 239, Decatur, Ala.

FOR SALE — Meters, transformers and chokes, some for use in scope; tube jacks; sockets—rotary and toggle switches, coil forms and blank chassis; also special wound transformer used for electroplat­
ing. List on request. Electrolite Scy­
craft Laboratory, 34 Green St., Marblehead, Mass.

FOR SALE — Altec-Lansing high fidelity dual channel speaker in burr walnut cabi­
net, handles 25 watt output easily, $175 F.O.B., S. E. Lessere, 28 Beekman Place, New York 22, N. Y.

FOR SALE — Handsets of every make and description, write your requirements. Develop-Wright Electrical Co., 697 Sixth Ave., Brooklyn, N. Y.

FOR SALE — Oscillator, $10; Superior 760P test meter, $20; bug, $10—pair air­
cord. headphones, $1.50; all practically new; also several small sets clean, V Liotta, 722 W. 1st Ave., Cheyenne, Wyo.

WANTED — Low frequency transmitters and receivers and Carrie current commu­
nication equipment. TomAllen, 540 St. Johns Place, Brooklyn 16, N. Y.

SELL OR TRADE — National 1-10 re­
ciever complete with coils, speaker and power unit; new with dial on left. Trade for radio or photographic ini­
teresting items. W. T. Golson, Box 263, Baton Rouge, La.

SELL OR TRADE — Abbott TR-4A complete with tubes AC power supply and view finder. Want small intercom­munica­tion 5 station system, at least two subs with the master. Bob Westfall, The Pines, woolwich, N. J.

WANTED — Information for converting BC-2223A transmitter to AC. Will pay cash or trade radio parts. All inquiries answered. E. Shaffer WAMSQ, 2599 East 116th St., Cleveland 20, Ohio.

FOR SALE — Hallafters 15 tube re­

WILL TRADE (in Canada) — New 614; 150 mill. 2200 vac variable; 1—40 mtr. and 2—10 mtr. xtal; dynamic mike; new Argus AP camera, for better Argus, pref­erably with coupled rangefinder, or other good 35mm make. J. P. Neil, W3PSN, 1127 Dufferin St., Toronto, Canada.

WANTED — HRO coils, also signs to sparker, preferably Moessbauer... etc.

FOR SALE — Kenwood, $40.

ASK FOR SPRAGUE CAPACITORS and *KoolOhm RESISTORS by name!


(Selling distributing organization for products of the Sprague Electric Company)

FOR SALE — Driver transformer Stan­
coe A-4712 and cathode modulation trans­
former Stanco A-3885, $5 plus postage. Charles M. Palmer, 1907 Roslan, Over­
land 21, Mo.

SELL OR TRADE — Converted BC-348P $50; unused TR-4; used DK-2 both with tubes. $60; Excellent BC-291 with bat­
teries, $40; SCR-522, Speco STAD, Su­
gro 502, ADF receiver, etc. Want Pan­adapt doorknob tracer or what have you! E. B. Page, Box 239, Decatur, Ala.

FOR SALE — Meters, transformers and chokes, some for use in scope; tube jacks; sockets—rotary and toggle switches, coil forms and blank chassis; also special wound transformer used for electroplat­ning. List on request. Electrolite Scy­ncraft Laboratory, 34 Green St., Marblehead, Mass.

FOR SALE — Altec-Lansing high fidelity dual channel speaker in burr walnut cabi­net, handles 25 watt output easily, $175 F.O.B., S. E. Lessere, 28 Beekman Place, New York 22, N. Y.

FOR SALE — Handsets of every make and description, write your requirements. Develop-Wright Electrical Co., 697 Sixth Ave., Brooklyn, N. Y.

FOR SALE — Oscillator, $10; Superior 760P test meter, $20; bug, $10—pair air­ncord. headphones, $1.50; all practically new; also several small sets clean, V Liotta, 722 W. 1st Ave., Cheyenne, Wyo.

WANTED — Low frequency transmitters and receivers and Carrie current commu­nnication equipment. TomAllen, 540 St. Johns Place, Brooklyn 16, N. Y.

SELL OR TRADE — National 1-10 re­ceiv...
famous the world over

Exacting users prefer JOHNSON wafer sockets because they are insulated with grade L4 steatite or better, top and sides are glazed, the underside is impregnated against moisture. Contacts are brass with steel springs, rivets are countersunk and mounting holes bossed to washers in molded recesses to prevent movement. E. F. JOHNSON CO. WASECA, MINN.

Illustrated above is the 122-225, a 5-pin socket which can be used with such tubes as the 6A7 or 7-pin small, for tubes such as the 6L6 and 815, 122-226, 6-pin for tubes such as the T21, 122-224, 4-pin for tubes such as the 812 or T40.

Also available are Giant wafer sockets for transmitting tubes, of 5- or 7-pin sizes, sockets incorporating a base shield, and Super Jumbo 4-pin base sockets.

(Continued on page 90)
HIGH SCORER

HQ-129-X

In any contest, Sweepstakes or DX, you will find HQ owners way up among the High Scorers. Why? Because the HQ-129-X has what it takes—plenty of selectivity to dig out those "down under" stations that you have to work if you want to be HIGH SCORER.

HAMMARLUND

THE HAMMARLUND MFG. CO., INC., 460 W. 34TH ST., NEW YORK 1, N.Y.
MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT
JOHNSON TUBE SOCKETS

World Famous

THOUGHTFUL design, superb workmanship and top quality materials are combined in the manufacture of JOHNSON sockets to earn for them the reputation as the world's finest.

Illustrated above is the JOHNSON 123-209 a 4-pin bayonet type socket for medium power tubes having a medium 4-pin bayonet base, such as the 866.

Also available is the 123-210, a similar JOHNSON socket that fits the same tubes as the 123-209 but which is slightly smaller in size.

The 123-211 is a larger 4-pin socket for tubes such as the 872.

The 123-216 is for tubes having a GIANT 5-pin bayonet base such as the 803 and RK28.

These high quality JOHNSON tube sockets, which represent only a part of the extensive JOHNSON tube socket line, are available in porcelain or steatite.

See them at your dealers or write for latest catalog

JOHNSON
a famous name in Radio
E. F. JOHNSON CO. WASEGA, MINN.

MIDWEST DIVISION

IOWA — SCM, William G. Davis, W9PP — The Council Bluffs Radio Operators Club held its first meeting Sept. 17 at Chillicothe Hotel. JRY has new beam. FWL is building new 34-ft. self-supporting tower for his beam. FP visited SEE and found his new kw. rig nearly ready to go on 28 Mc. PGQ is working for GPQ. UQJ is working v.h.f. for UP Railroad. QFZ, K172 and TVX are working 144 Mc. The Iowa gang was in there pitching during the simulated emergency test. Those taking part were RSL, TQQ, MTS, IFB, and TWX. Members of the Iowa 75 Net are giving all out for the BC-654 for emergency operation. OJQ has had 16 contacts on schedules with J2AAY with traffic on five of the schedules. FP is building up FB Emergency Corps in Quad City area. HMM is busy with organizational work in Tall Corn Net and Trunk Line "A." WMU renewed his EC appointment. WMU gave a public demonstration of the value of ham radio for emergency communications. RSV and QAZ are in San Francisco awaiting 6 calls. TWX calls his Iowa City Emergency Corps at 12:15 P.M. and the members are at their allotted places and all working at 1200 p.m. AYC has new BC-654. OBS transmissions are made on 3500 kc. Monday through Friday by SEF. WQQ is working ZLz on 3.35 Mc. OR3ID visited Cedar Rapids. MKP is building 14-Mc. beam. FP has OR8 certificate No. 245 signed by C. D. Traina and B. L. Martin, and counter signed by A. A. Hecbert. Traffic: WH4MM 167, AUL 152, FP 50, QVA 40, WML 30, PP 28, SEF 20, TIIH 20, AYC 11, WMU 5.

KANSAS — SCM, Alvin B. Unruh, W9AWP — CXF, Ft. Scott, is now ORS-QKS netter. Eight Wichita emergency net members assisted police department on Halloween as an emergency test under actual conditions. 20.6 Mc. was used, with reflux B1/2 as NCS. Results were excellent. In the CD Party BQJ had 303 QSOs for a score of 373,500. FBI NJ3 and AWP also ran. At Salina, OES PED is active on 50.4, 144, and 420 Mc. Also active on 420 Mc. are MVG and INM. AGC and KBQJ/8 are active on 23-Mc. phone with high power. ESL has 3.85-Mc. schedule with BOR. At Chanute, IFR, EC, works 3.9-Mc. phone and 3.5-Mc. c.w. LYP and TXY are active there at times. OZN worked a Mexican station on 3.85-Mc. phone and received word that several Mexican hams copy official bulletins regularly. OUU is working 7 Mc. Field Kindley H. S. Radio Club (Coffeyville) officers are: BAC, pres.; YMT, vice-pres.; BAY, secy. The club transmitter is on 28-Mc. phone. QAQ and BQJ added more countries to their worked lists. MAME was selected as 3.85-Mc. OBS by the Heart of America Radio Club, Kansas City. KVRB. Topeka, held an emergency drill on Oct. 12th, using both fixed and mobile stations. New Callan, HUR, and DRL, AVO, on 3.5 Mc. were BQJ and AGC has NO-173. SKW has BC-610 and Super Pro. IP1 has HF-152 converter and HYQ-75 transmitter, with four-element beam. BXZ has HT-9 transmitter. Traffic: WBNJS 77, KBY 42, ONS 25, OAQ 22, ERY 19, BRR 17, AWP 19, IFR 7, LFB 7, MAE 8, AET 2, ZMC 2.

MISSOURI — SCM, Mrs. Letha A. Dangerfield, W9OUD — Reports indicate the expected increase in activity has arrived with the cooler WX. The council has been building new 28-Mc. beam rotator and an 835 final for same band and is working over his 813 final. SKA laboried hard to get gear ready for the emergency test and the batteries went down after he contacted the NCS. Then on Halloween some gobus put his twin leads up a tree so he is going to water proof it before putting it back where it belongs. KIK's new receiver is a big improvement. CMH rebuilt for the SS. ZIS reports increased activity on 144 Mc. He heard KLVDY on that band and wondered if he could not get on the air. He decided to built a 2 meter station and built 24 hours. He worked 280 minutes and managed 122 hours and 11 minutes in October, and had 230 QSOs on 7 Mc. running 75 watts to pair of 807a. GCL has moved to St. James. VMO reports a good turnout for emergency test. EOE is active in any test. MOC crystal. DEA worked 56 stations in 28 sections in the 3 hours and 20 minutes he had for last CD Party. GBJ is active on 14 Mc. MDE is the first YD to join AEC. BCD has applied for OBS appointment. QK5 is running in circles keeping all his traffic schedules. ZZW is at the same with school work plus operating in MON. ZVS is leaving as NCS of MON since he is taking job as operator on a river boat. OUD finds 3.5 Mc. very good in the morning. Traffic: W9QXO 147, ZVS 90, ECE 23, AYF 24, OVS 23, VNO 22, SKA 14, KIX 11, ZZW 19, DEA 9.

NEBRASKA — SCM, William T. Genmer, W8RQK — (Continued on page 94)
TRULY HERMETICALLY SEALED...
FOR POST-WAR PERFORMANCE
100% GUARANTEED
SEALED LIKE A VACUUM TUBE

Marion Glass-To-Metal Truly Hermetically Sealed Electrical Indicating Instruments are guaranteed for six months. You get top performance...critical accuracy...at a cost no more than that of most competitive unsealed instruments.

Additional economy is offered in Marion's special replacement offer. After the initial six-month guarantee expires, any 2½” and 3¼” type, ranging from 200 microamperes upward, will be replaced, regardless of whether the instrument has been overloaded, burned out, or mistreated...provided the seal has not been broken, for a flat fee of $1.50. Instruments with sensitivity greater than 200 microamperes will be replaced for $2.50.

MARION "4 FOR 1" FEATURE
Interchangeable Round and Square Colored Flanges...one instrument can thus fill four different needs:

1. ROUND
2. ROUND FOR STEEL PANEL
3. RECTANGULAR
4. RECTANGULAR FOR STEEL PANEL

Stop in at your nearest radio supply shop today and see the best in electrical indicating instruments...the Marion line.

MORE EXTRAS WITH MARION "HERMETICS"

DURABLE
...Unaffected by extremes of heat or cold...permanently protected against dust, dirt, moisture...instrument malfunctioning eliminated.

SHIELDED
...Heavy steel case gives magnetic and electrostatic shielding so important in modern high frequency equipment.

INTERCHANGEABLE
...The Marion case, with its high conductivity plating, eliminates the need for separate shielding and permits interchangeability on any type of panel without affecting calibration.

DRESSY!
...Marion "hermetics" are supplied with either round or square flanges in black...or any one of 12 iridescent colors at no extra cost.

Marion Electrical Instrument Co.
Manchester, New Hampshire

In Canada: The Astral Electric Company, Scarborough Bluffs, Ontario

THE NAME "MARION" MEANS
THE "MOST" IN METERS

91
ALMOST every amateur designer at one time or another has been confronted with the task of making a single DC meter do multiple duty for measurement of voltages and currents in several electrically isolated circuits.

The most common and practical approach for accomplishing this task has been to employ a switch of some sort by which the meter may be moved electrically from circuit to circuit.

Unfortunately, however, not all conventional switching arrangements employed for this purpose have been completely free from limitations. For example, one such switching circuit commonly used permits measurement of either currents or voltages, but not both with the same meter. Another provides measurement of total current drawn by each in turn of several tubes but does not permit measurement of plates and screens separately. And with none of the popular switching
circuits is it possible to use the basic movement of the meter when both currents and voltages are to be measured.

Ideally a meter switching circuit should be so arranged that with its use a single meter may be inserted into or removed from each in turn of several isolated circuits. It should be possible to measure either voltages or currents as desired. Automatic insertion and removal of multiplier shunt or series resistors should be provided as required for expansion of the basic movement of the meter. Automatic observance of polarity should be provided so that either plate or grid currents may be measured. And it should be possible to use the basic movement of the meter when needed.

At first glance the design of a meter switching circuit incorporating each and every one of these ideal conditions would appear to be virtually an impossibility. Fortunately, however, this apparent impossibility easily becomes a practical possibility with use of a proper switch. Such a switch is available in the Mallory standard 1400L.

The 1400L has not been too widely known among Amateur designers. However, its features are ideal for this service, not only for meter switching in low power transmitters, but also in test equipment. It is so arranged that with its use a single DC meter may be inserted directly into or across any one of 12 isolated circuits for direct measurement of currents or voltages as desired. All this may be had without disturbing the electrical continuity of any of the other 11 circuits. In addition, as each circuit is selected for measurement, external shunt or series resistors may be thrown automatically into the circuit, thus increasing the basic voltage or current range of the meter.

The 1400L is a 12 position, 4 section switch. The outer 2 sections consist of 1 circuit 12 position wafers of the non-shorting type. The inner 2 sections consist of wafers with 12 positions but of a special construction to permit automatic shorting of all like positions between wafers with the exception of the position in use at any one time.

Your nearest Mallory distributor has catalog information about the 1400L and we have prepared a representative schematic with a description of how to use this switch in a low power transmitter. Circuit information is available for the asking. Just write us at Box 1558, Indianapolis 6, Indiana, and mention "Amateur Meter Switching".

You can rely on Mallory Precision manufacturing to supply you with the most dependable line of: resistors, ham band switches, push button switches, controls — rheostats — potentiometers — pads, tubular capacitors, transmitting capacitors, dry electrolytics, dry disc rectifiers, vibrators and vibrator power supplies, practically every component you need to keep your rig in A-1 condition.
There’s no longer any need to run down stairs, out in the back yard to turn your beam. The Munger Bectro-Beam Rotator’s
94

Foolproof Potentiometer and Meter Circuit. Calibrations In Both Degrees and Directions.

AT ONLY

$69!~PLITI

Inquire About Our Time Payment Plan

Don’t Lose Those Good QSO’s While Turning Your Beam by Hand

There’s no longer any need to run down stairs, out in the back yard to turn your beam. The Munger Electro-Beam Rotator’s positive-action drive saves you those trips in any weather, any time of the day or night. A reversing switch mounted on the calibrated direction indicator permits you to pick up your own and received signals in a few seconds. Enjoy the thrill of holding those rare DX contacts right through heavy QRM!

Ruggedly built for all-weather, year-round operation without attention. Swings any 10 meter beam or a light 20 meter array at 1 R.P.M. Rotator weighs only 10½ lbs. 115 V., 60 cycle operation.

FREE Inspection Offer — No Risk

Send your check for $69.50 for one Bectron-Beam Rotator complete with Direction Indicator and Instruction sheet. Pay small shipping charge upon arrival. If you are not completely satisfied, return the units In ten days and your money will be refunded in full. You can’t go wrong!

Illustrated Bulletin on Request MANUFACTURED AND SOLD EXCLUSIVELY BY

 Rex L. Munger Company
4701 Sheridan Rd., Chicago 40, Illinois

(Continued from page 90)

DXL is back pounding brass on 3.85 Mc. ZBT is getting a c.w. rig fired up. FQB reports that BFT is active on 28 Mc. EKK is going back to 3.85-Mc, ’phone with 1 kw. WIP has BC-510 and put up 40-foot steel tower for 28-Mc. beam. RGG has wide-spaced three-element beam working at 7 Mc. RULI hoisted three-element 28-Mc. beam to 34-foot pole. ZX9 is now a D4. The Ak-Sar-Ben Radio Club changed meeting nights to the fourth Tuesday of each month. FQB is active week nights on 7- and 3.5-Mc. c.w. Thanks, FQB, for all the news. GDB is on 14 and 3.85 Mc. with 500 watts into a 4/250A modulated by two 4/125A’s, a Hammarlund 400 receiver. YOD is active on 28-Mc, ’phone, NXY, running 55 watts to an 807 final, has worked VK5, RZ5, RH3, KLF, KV3, and 45 states. He is using a new HQ-1290X for copying them and has a 400-watt c.w. rig under construction. GPX is using a new three-element wide-spaced homemade beam and a VHF-182 on 28-Mc. ATB is running 300 watts on p.p. S7T is into a 3 full-wave Johnson O. EK5 has BC-610 exciters unit for all bands, CMO is on 28-Mc. ’phone. The Nebraska Emergency ’Phone Net is active on 3083 kc. daily at 1230 p.m. through the efforts of MLB, Pioneer Radio Club bans, NVE, VMP, and OED, took part in quarter-hour program over station KORN during Radio Week. NVE and VMP are active in 3.85-Mc. ’phone net handling traffic. AYO is on 7-Mc. c.w. and 28-Mc. ’phone. Traffic: W6EWO 3.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1EQY — We sincerely regret the loss of KKS, who was killed in an accident. Club News: NARL: The club’s new station call is QMP, NIM and DXT operated on 3.5, 14, and 28-Mc. FWH, OKY, AVN, and OHK on 144 Mc. during AEC drill. The club has purchased SCR-522 and 500-watt gas-driven generator. MRC: Newly-elected officials are: IYL, pres.; NMP, vice-pres.; DJC, secy.; EJT, treas. The club still is using 20-year-old engine driving a rewound Dodge generator, output 1 kw. for emergency power. BARA: AFW is new club member. GVK has postwar WAC. Code classes are held Tuesdays at OPG and Fridays at club. NIIARA: Newly-elected officials are: OEX, pres.; NGQ, vice-pres.; ATI, secy.; JQK, treas.; KQY, LTZ, and OOH, direction. AMM is conducting code and theory classes and QAK is chief operator. NWC has new exciter built by EQQ. CQRC: Newly-elected officials are: BIH, pres.; RXB, vice-pres.; OQM, secy. and treas. Nine licensed and six non-licensed hams meet the 1st and 3rd Thursdays of each month, at each other’s QTH. PEN is active on 144 Mc. SARC: OQK reports Red Cross emergency tests still are being conducted. The radio room in Red Cross Building is equipped with SCR-522 and a 60-watt rig on 3.5 Mc. News in general: A. W schedules 28SP, TN has new antenna ranch for QTH in South Coventry. INP is using p.p., 35Ts 813s 450 watts to new antenna. DWP has new 14- and 28-Mc. beams. EZ7 is on 7 Mc. OEN now is CA in Farmington. APA has new three-element 14-Mc. beam. JAK and WR are gunning for WAS using 28-Mc. transmitter and receiver and transmitter along with AYT-13. JAK and EQV visited CH, who has swing 14- and 28-Mc. beam. EDI has new FT-17, IYI has new beam. NMP and DJC are working plenty of DX. ADW is building new rig with VFO. Doctor’s orders make a layoff necessary so VB, of Newtown, is now Acting SCM. Traffic: W1AW 921, DAV, 443, INF 375, NMP 265, VD 302, EPW 252, RXY 173, BDI 154, LFE 100, GRP 55, JQD 42, TD 52, FBD 20, DXT 19, ADW 10, APA 14, HYS 6, MUD 3, HIN 2.

MAINE — SCM, F. Norman Davis, W1GKE — SEC: LNI, PAM; FJ, RM: NXX. Renewed OBS: FV. Renewed OBS: LNI. New OBS and EC: LDC. Congratulations to all who participated in the ‘phone and c.w. portion of the recent emergency tests for all types of traffic in the emergency caused by forest fires. The nets were carried on in a superb manner and a great deal of credit for this must to go those who stood by on the frequencies, to be ready if needed or to reduce interference. Not to be forgotten was the splendid work done by stations, both in and out of the State, in monitoring the emergency frequencies and informing those who unintentionally caused interference. The Portland Amateur Radio Club announces the following officers: CRP, pres.; JRS, vice-pres.; LZI, treas.; MVP, secy.; LNI, chief operator. VV has a fine radio amateur activities column in the Portland Sunday Telegram every week. NXX, net control for the P.A.R., reports activity increasing, but more stations are needed. If inter-
This tuning condenser, used in the famous National NC-2-40D, is a perfect example of National's flawless construction and design. Engineered and manufactured in National's own plant, it is of extremely rigid construction, preventing unwanted frequency modulation due to vibration. Three bearings on the rotor shaft assure permanent alignment. The drive is through a large pre-loaded gear. No strings to deteriorate, no backlash! Each rotor is individually insulated and has its own contact. Stator insulation is low-loss steatite.

With precise, rugged components like this, no wonder National communication receivers lead the field—in any climate, under all operating conditions! National precision components are available at your dealer's.

NATIONAL COMPANY INC., MALDEN, MASS.

A superb receiver for either commercial or amateur use covering frequencies from 490 kcs. to 30,000 kcs. Calibrated electrical bandspread tuning on the 80, 40, 20 and 10-11 meter bands. A 40 to 1 main tuning drive mechanism provides exceptional tuning accuracy on all bands. Design features include temperature compensation, automatic voltage stabilization, a series valve noise limiter, new flexible crystal filter and phone input. Operates from 115 or 230 volts AC. Eleven tubes plus rectifier. Try it—compare it—today at your dealer's!

$225.00 (speaker extra)
MODEL 802 SUPER-HETERODYNE RECEIVER
An amateur-band-only receiver using i.f. regeneration to give variable phone up to single-signal CW selectivity. Following A. R. R. L. HANDBOOK teachings, it provides more than usual S-tube results, over 7 feet of band spread on 80, 40, 20, 16, 11 -10, and 6 meter bands, all for only $38.95 less tubes, power supply and coils at $1.00 per pair.

MODEL 701 TRANSMITTER
Goes into more amateur stations to produce more CW than anything else, it seems. A 6AQ5 Trifet drives on 807 to 75 watts CW, 30 watts phone, input, 80 through 6 meters. Modulator is built-in. Less coils (3 per band at $0.50 ea.), power supply, 4 tubes and crystal, it's the outstanding transmitter "buy" at $36.95.

MODEL 908 MICROMATCH
Standing wave ratio and r.f. wattmeter will let you put more power into your antenna --- from your present transmitter -- for only $29.90.

MODEL 903 ABSORPTION WAVEMETER
Is close to the most useful instrument in any shack. Thousands in use attest its prime necessity. Price is but $3.30 net, plus $.65 ea. for plug-in coils covering 1600 kc. up to 500 mc.

Send for New Amateur Catalog

(Continued on page 100)
It's Easy Now TO GET THAT NEW GEAR

All the latest ham gear... receivers, transmitters, test equipment, amplifiers, beam antennas, wire recorders, etc... now offered by the RADIO SHACK on these new, far easier credit terms. You can start enjoying your new equipment RIGHT NOW. Just send us 10% of the total cost and take a full year to pay the rest.

**RECEIVERS • TRANSMITTERS • AMPLIFIERS • TEST EQUIPMENT • BEAM ANTENNAS • WIRE RECORDERS**

You can get any of this gear on our easy PLAY AS YOU PAY terms.

Order Today

SEE HOW EASY IT IS TO PLAY AS YOU PAY

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Equipment Code</th>
<th>Net Price</th>
<th>Down Payment</th>
<th>Per Mo. for 12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NATIONAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC-46</td>
<td>1</td>
<td>107.50</td>
<td>10.74</td>
<td>8.54</td>
</tr>
<tr>
<td>NC-57</td>
<td>1</td>
<td>89.50</td>
<td>8.95</td>
<td>7.12</td>
</tr>
<tr>
<td>NC-173</td>
<td>1</td>
<td>189.50</td>
<td>18.95</td>
<td>15.07</td>
</tr>
<tr>
<td>NC-240D</td>
<td>1</td>
<td>241.44</td>
<td>24.14</td>
<td>19.20</td>
</tr>
<tr>
<td>HRO-7</td>
<td>2</td>
<td>311.36</td>
<td>31.14</td>
<td>24.75</td>
</tr>
<tr>
<td><strong>HALLICRAFTERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-38</td>
<td>1</td>
<td>47.50</td>
<td>4.75</td>
<td>7.55*</td>
</tr>
<tr>
<td>S-40A</td>
<td>1</td>
<td>89.50</td>
<td>8.95</td>
<td>7.12</td>
</tr>
<tr>
<td>SX-42</td>
<td>4</td>
<td>275.00</td>
<td>27.50</td>
<td>21.86</td>
</tr>
<tr>
<td>SX-43</td>
<td>3</td>
<td>189.00</td>
<td>18.90</td>
<td>15.03</td>
</tr>
<tr>
<td>S-47</td>
<td>4</td>
<td>200.00</td>
<td>20.00</td>
<td>15.90</td>
</tr>
<tr>
<td>HT-9</td>
<td>5</td>
<td>350.00</td>
<td>35.00</td>
<td>27.83</td>
</tr>
<tr>
<td>Coils: 10M—$10.50; 20M—$15.50; 40M—$11.75; 80M—$10.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HT-17</td>
<td>5</td>
<td>69.50</td>
<td>6.95</td>
<td>5.53</td>
</tr>
<tr>
<td>HT-18</td>
<td>6</td>
<td>110.00</td>
<td>11.00</td>
<td>8.75</td>
</tr>
<tr>
<td><strong>HAMMARLUND</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HQ-129X</td>
<td>1</td>
<td>189.15</td>
<td>18.92</td>
<td>15.04</td>
</tr>
<tr>
<td><strong>R.M.E.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RME-64</td>
<td>1</td>
<td>98.70</td>
<td>9.87</td>
<td>7.85</td>
</tr>
<tr>
<td>RME-43</td>
<td>1</td>
<td>198.70</td>
<td>19.87</td>
<td>15.80</td>
</tr>
<tr>
<td>RME-152A</td>
<td>7</td>
<td>86.00</td>
<td>8.60</td>
<td>6.89 or 13.77*</td>
</tr>
<tr>
<td>RME-DB-22A</td>
<td>7</td>
<td>66.00</td>
<td>6.60</td>
<td>5.25</td>
</tr>
<tr>
<td><strong>MEISSNER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal Shifter</td>
<td>8</td>
<td>66.00</td>
<td>6.60</td>
<td>5.25</td>
</tr>
<tr>
<td>Coils: any band — $4.00 per set</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply — $13.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SONAR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VFX-680</td>
<td>9</td>
<td>87.45</td>
<td>8.75</td>
<td>6.95</td>
</tr>
<tr>
<td>Coils: any band — $1.50 per set</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB-611</td>
<td>10</td>
<td>72.45</td>
<td>7.25</td>
<td>5.76</td>
</tr>
</tbody>
</table>

ONLY 10% DOWN AND A YEAR TO PAY THE REST

Write today for your time payment application and be ready to PLAY as you PAY

EQUIPMENT CODE

1. Tubes, speaker, built-in power supply
2. Tubes, speaker, and separate power supply
3. Tubes, built-in power supply, and R-44 bass-reflex speaker
4. Tubes and built-in power supply, less speaker
5. Tubes and power supply—less coils and crystals
6. Tubes and power supply—less crystal
7. Tubes and power supply
8. Tubes—less coils and power supply
9. Tubes and one set coils
10. Tubes—less crystal and power supply

* 6 monthly payments

The RADIO SHACK Corp.
Cable Address: RADIOSHACK
167 Washington St., Boston, Mass., U.S.A.
SURPLUS VALUES to fit your purse at the
RADIO SHACK

DYNAMOTOR SPECIALS — ALL BRAND NEW

PE-73 — 24-23 v. d-c input, 1000 v.
350 mil d-c output .................................. $10.00
BD-77 — 14 v. d-c input, 1000 v.
350 mil d-c output .................................. 7.95
PE-55 — 12/24 v. d-c input, 500 v.
400 mil d-c output .................................. $ 9.00

All outputs well filtered.

BRAND NEW BC-348 COMMUNICATIONS RECEIVED

$69.50

Guaranteed absolutely new and unused — in original, unopened, wood shipping case. Complete with built-in dynamotor, crystal filter, full set of tubes, and detailed AAF technical manual. Shippping weight: 61 lbs. Kit for conversion to 115v-a.c. operation, with full instructions ........................................... $6.50

Genuine "MAC" Key Model 200 69c

Here’s a price-bustin’ bargain — 3/16" silver contacts ... circuit closer ... teardrop base with black wrinkle finish, heavily chromed parts. A professional model at a "give-away" price.

TUBE PRICES REDUCED

Check these values!

<table>
<thead>
<tr>
<th>Type</th>
<th>Net</th>
<th>Type</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>2C34</td>
<td>.45</td>
<td>886</td>
<td>1.00</td>
</tr>
<tr>
<td>2C40</td>
<td>.90</td>
<td>874</td>
<td>1.95</td>
</tr>
<tr>
<td>2D21</td>
<td>.60</td>
<td>VR105</td>
<td>.75</td>
</tr>
<tr>
<td>3884</td>
<td>.75</td>
<td>VR160</td>
<td>.75</td>
</tr>
<tr>
<td>3BP1</td>
<td>3.00</td>
<td>911A</td>
<td>1.85</td>
</tr>
<tr>
<td>5BP4</td>
<td>2.25</td>
<td>954</td>
<td>.75</td>
</tr>
<tr>
<td>6AK5</td>
<td>.60</td>
<td>985</td>
<td>.75</td>
</tr>
<tr>
<td>211</td>
<td>.37</td>
<td>977</td>
<td>.75</td>
</tr>
<tr>
<td>6CG2</td>
<td>1.50</td>
<td>988</td>
<td>.75</td>
</tr>
<tr>
<td>3E29</td>
<td>3.00</td>
<td>869</td>
<td>.75</td>
</tr>
<tr>
<td>2X2A</td>
<td>.90</td>
<td>1619</td>
<td>.15</td>
</tr>
<tr>
<td>301</td>
<td>.75</td>
<td>1625</td>
<td>.50</td>
</tr>
<tr>
<td>803</td>
<td>9.00</td>
<td>1624</td>
<td>.90</td>
</tr>
<tr>
<td>809</td>
<td>1.50</td>
<td>1626</td>
<td>.50</td>
</tr>
<tr>
<td>811</td>
<td>1.25</td>
<td>1629</td>
<td>.15</td>
</tr>
<tr>
<td>813</td>
<td>9.00</td>
<td>1651</td>
<td>.75</td>
</tr>
<tr>
<td>815</td>
<td>2.25</td>
<td>8066</td>
<td>3.15</td>
</tr>
<tr>
<td>(VT287)</td>
<td>9001</td>
<td>.32</td>
<td></td>
</tr>
<tr>
<td>826</td>
<td>9002</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>(VT224).255</td>
<td>9008</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>822</td>
<td>9004</td>
<td>.26</td>
<td></td>
</tr>
<tr>
<td>(VT118).255</td>
<td>9006</td>
<td>.67</td>
<td></td>
</tr>
</tbody>
</table>

Minimum tube order $2.90

BRAND NEW Eimac 304TH

JAN-inspected $3.95 ea.

BRAND NEW 807's

90c ea.

BRAND NEW G.E. BC-645A — ONLY

$9.95

Get going on 420 with this "hot" xmt-revr for phone and i.e.w. Originally priced over $2000, they cost you less than the price of the 15 tubes you get with the outfit. Full conversion instructions furnished.

BRAND NEW! RADIO RECEIVER BC-1206-A

$48.50 with tubes

TUBE SUPER SPECIALS

BRAND NEW Eimac 304TH

JAN-inspected $3.95 ea.

BRAND NEW 807's

90c ea.

BRAND NEW! BC-645A

$9.95

Handy, all-round xmt-revr in ventral case; tubes 200-400 kc.; five tubes give pre-selector, converter, oscillator, acoustical, and A.F. Tubes 300 mil at 22 v. Filtered, shielded battery lead.

"BUG" KEY

Brand New J-36 Limited Quantity

$6.95

You’ll be pleasantly surprised at this value ... it’s counterpart has been sold by a well-known item manufacturer at more than double our bargain price. Made for the Signal Corps by Lionel Corp., supplied new in case, cord, wedge plug, and switch.

BRAND NEW ANH-81 PHONES

Complete with headband, cushions, cord, extension cord, and plug.

BC-221 FREQUENCY STANDARD

$36.95

Fundamental ranges 125-250 and 500-1600 kc. Stability better than 0.005%. Works on 110 v. ac., batteries, or vibrator. Use it for a signal generator or to make a wonderful VFO. Complete with tube, original crystal and calibration charts. Used but excellent working condition.

NEW 30-FOOT

TRYLON TOWERS $69.50

Ideal for beam antenna mounting. Made of copper bearing steel, hot dipped galvanized. Rigid, three-sided structure has horizontal cross braces forming complete vertical ladder for climbing. Complete with base plate, foot castings, screw anchors, steel guys, and all hardware. Shipped knocked down. Wt. 388 lbs.

MINIMUM TUBE ORDER $2.90
SELENIUM FULL-WAVE RECTIFIER $3.95
A-c input 35 volts; d-c output 28 volts, 3.5 amperes.

FM ALTIMETER RCVR-XMTR RT-7/APN-1 $995
Complete outfit for 418-462 mc operation includes dynamotor and 14 tubes: 4 - 12SH7, 3 - 12S17, 2 - 12H6, 2 - 955, 2 - 1604, 1 - VR150. Size 18 x 7 x 7¼". Used but in good condition.

BRAND NEW MOUNTED CRYSTALS
For 2-meter Band 95c ea. These are not surplus but were made for us by one of the leading manufacturers of crystals.

GIBSON GIRL AUTO-XMTR
ONLY $9.95 complete
Hand-cranked auto - xmtt with 400-ft. antenna wire, collapsible box kite, 2-4 ft. balloons, hydrogen generator and inflating equipment. Hand generator makes fine emergency power supply; you can use the balloons for sky-books on your vertical antenna; and fly the box kite just for fun. Packed in waterproof case.

MOBILE RCVRS $9.95
XMTRS $9.95
RCVRS Great for stand-by on 40-80 meters; phone or CW; ample bandspread; complete with 5 tubes.
BC-454-B 8-6 MC $9.35
BC-448-B 6-8 MC each
XMTRS Furnished with 4 tubes, including 1629 magic eye, 1626, and 2-1625's; also calibrating crystal.
BC-466-A 2-4 MC $9.95
BC-460-A 6-9 MC 9.95
Shipping Wt. - rcvr or xmtt - 13 lbs. ea.

RADIO COMPASS UNIT BC-433-G $10.95
Use it as a spare for your radio compass or convert it to a triple superhet covering the broadcast band. Covers 200-410-850-1575 kc. Fifteen tubes: 6N7, 6L7, 6SC7, 6J5, 524: two each 6F6, 6B8, and 2651; four 6K7; wired for 14 or 28 vdc operation. Used but in good condition. Price includes full set of tubes.

NEW 50-FOOT TUBULAR MASTS $17.50
Light-weight yet sturdy mast consists of 6 sections of tubular plywood telescoping together. Metal band at top of each section prevents splitting; wood ring near base of each section limits telescoping. Mast 6½" O.D. at base, 4" O.D. at top. Kit includes ground spikes and two extra sections (10 ft. x 3¼" and 8 ft. x 3¼"), Wt. 170 lbs.

NEW LOW PRICES on Popular Tubes - Parts and Surplus Specials

FM ALTIMETER RCVR-XMTR RT-7/APN-1 $995

RADIO SHACK Corp.
CABLE ADDRESS: Radioshack
157 Washington St., Boston, Mass., U.S.A.

Speed delivery and save C.O.D. charges - send full amount with order, 50% deposit required on all C.O.D. orders.
J. L. A. McLaughlin, Designer of Receivers, wishes to announce that work on the SIGNAL SPLITTER is nearing completion. The Signal Splitter is an advanced amateur model of the single sideband heterodyne eliminator system described in the October issue of QST. Complete technical specifications, prices and delivery date will be announced in the near future. J. L. A. McLaughlin, Box 529, La Jolla, Calif.

SECOND NEW HAMPSHIRE QSO PARTY
Feb. 7-8, 1948

Here is your chance to get NEW HAMPSHIRE for WAS!

Time: Saturday 6 P.M. EST to Sunday 6 P.M. EST.

There will be no time limit and no power restrictions. An engraved certificate will be issued to all stations who send in their report. Special certificates will be awarded for the highest all-phone and all-c.w. scores in New Hampshire, as well as for the same high scores from outside the state.

Scores: FOR STATIONS OUTSIDE OF N. H., 6 points per contact with each N. H. station, total points to be multiplied by the number of different N. H. counties worked (10 maximum). FOR STATIONS IN N. H., 5 points per contact with each N. H. station, 1 point per contact with stations outside N. H., total points to be multiplied by the number of N. H. counties worked.

Exchange of information required: Stations outside N. H. give RST (or RS on 'phone) report, plus their city or town and state. Stations in New Hampshire give RST report plus their county. Contest reports must list all information exchanged. The same station may be worked for additional credit on another band, 'phone or c.w. The general call will be "CQ NH" on c.w. and "CQ New Hampshire" on 'phone.

Scores must be received not later than February 28th. The decisions of the Committee will be final. Reports and scores should be mailed to Dorothy W. Evans, W1FTJ, Box 312, Concord, N. H. Committee members include W1AOG, W1APR, W1FTJ.

This Second New Hampshire QSO Party is being sponsored by the Concord Brasspounders, W1OOC, of Concord, N. H., who extend to all interested hams the invitation to join in the fun. New Hampshire Counties which can be worked are: Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, Sullivan.

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC—DWO has moved to 89 Van Kleek Road, Millis, Mass., and Rhode Island loses one FB 00. QR works TL "C" Tuesdays and Fridays. The NAARO formed a new net on 29,080 kc. which meets the 3rd and 3rd Fridays at 8:30 P.M. NCF.
RELAYS—provide convenient circuit control, protection, and greater operating efficiency... help reduce length of connecting leads. Amateur Relays available from stock: Antenna Change-Over, Antenna Grounding, Keying, Band Switching, RF Break-In, Safety, Overload, Underload, Latch-In, Remote Control, Sensitive, Time Delay. Also Industrial and General-Purpose Relays.

RESISTORS—exclusive features of VITROHM wire-wound resistors insure that extra performance needed in critical circuits. Fixed type in 8 stock sizes from 5 to 200 watts. Adjustable type in 7 stock sizes from 10 to 200 watts. Wide range of resistance values. Stripohm, Discohm, and Plaque types also available.

RHEOSTATS—for fixed or variable close control. Protected by tough, acid resistant, crazeless vitreous enamel. Sizes: 25, 50, 100, and 150 watts, in wide range of resistances.

Authorized Distributors Everywhere
WARD LEONARD ELECTRIC COMPANY
Radio and Electronic Distributor Division
53-B West Jackson Blvd., Chicago 4, U. S. A.
For PERFECT OPERATION
INSIST ON

Harvey-Wells

TBS - 50
TRANSMITTER

★ 50 WATTS ★ PHONE OR CW
★ NO PLUG-IN COILS ★ 8 BANDS WITH BAND SWITCH
★ CRYSTAL CONTROLLED ON ALL BANDS ★ OSCILLATOR OR MULTIPLIER TUNING
★ FOR FIXED STATION OR MOBILE OPERATION ★ TWO METERS TO 80 METERS
★ SIZE 8" x 13" x 9"

PRICE - incl. tubes $99.50

and the
Harvey-Wells

station monitor

★ SIZE 19" x 5 1/4" x 5 1/2"
★ PROVIDES AUDIO NOTE FOR MONITORING ANY CW TRANSMITTER ★ NO TUNING OR BAND SWITCHING REQUIRED ★ PROVIDES PHONE MONITOR WITH 2 STAGE SPEECH AMPLIFIER ★ 4" PM SPEAKER AND PHONE JACK ★ BUILT-IN POWER SUPPLY

PRICE - incl. tubes $34.75

Manufactured by
Harvey-Wells Electronics, Inc.
Southbridge Massachusetts

NORTHWESTERN DIVISION

Alaska - SCM, August G. Hibbert, KY7BF - After disbanding for the summer months, the Arctic Amateur Radio Club of Fairbanks has begun winter operations by electro-mail of messages by electronic means by electronic means. KIB was a new ham in Butte. EQM returned home from

Oregon - SCM, Raleigh A. Munkres, W7HAZ - We appreciate all the fine reports this month, gang! Keep them coming. Klamath Falls: The Klamath Amateur Radio Society was granted an A.R.R.L. Charter. EWM and his XYL, LEG, are running each other competition on 28 Mc. FJD

(Continued on page 104)
SUPERSeded
BY TODAY'S
SMALLER,
FAST-SHOOTING
AUTOMATIC
RIFLE

MODERN DESIGN
IS COMPACT!

That's why Ken-Rad miniature
tubes do an oversize job in your rig

ADDING a frequency calibrator to your receiver? Revamping your a-f amplifier? . . . Work like this often crowds a chassis, making the new circuit impractical if standard tubes are used. But you can do it with Ken-Rad miniatures.

The 6AQ5 is a case in point. This trim little beam power amplifier is some ½ the height of the 6V6 and half the diameter—yet it is the 6V6's equivalent both in ratings and performance!

Two 6AQ5's, for example, make a first-class driver for a pair of 805's. You can tuck the tubes in a surprisingly small space, and they'll serve you just as well and long as would their larger counterparts.

For a quick "refresher" in miniatures, visit your nearest Ken-Rad distributor or dealer. Take these finely made tubes in your hand; note their compactness and strength; then check their ratings. Here is smallness with power; space saving with big-tube performance . . . Here's value!

KEN-RAD
PRODUCT OF GENERAL ELECTRIC COMPANY
Schenectady 5, New York

KEN-RAD MINIATURE

Typical Operation, Class A Amplifier

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate voltage</td>
<td>250 v</td>
</tr>
<tr>
<td>Screen voltage</td>
<td>250 v</td>
</tr>
<tr>
<td>Plate current</td>
<td>45 ma</td>
</tr>
<tr>
<td>Load resistance</td>
<td>5,000 ohms</td>
</tr>
<tr>
<td>Power output</td>
<td>4.5 w</td>
</tr>
</tbody>
</table>
DO YOU INSIST ON THESE ESSENTIAL CHARACTERISTICS?

CHECK THIS LIST

1. Low operating temperature
2. Low noise level
3. Well anchored, easily soldered leads
4. Positive contact between resistance element and wire leads
5. Excellent wattage dissipation
6. Fully insulated
7. Maximum protection against humidity
8. Sturdy construction
9. Light weight
10. Compact size

When buying resistors for your rig, ask for and be sure to get IRC BT or BW Resistors ... with proven excellence in all 10 of these important characteristics.

Big 8-page catalog bulletin with complete technical data on all 10 characteristics plus other valuable information about IRC BT Insulated Composition Resistors and Type BW Insulated Wire Wound Resistors. Write for Bulletin F27 now.

INTERNATIONAL RESISTANCE COMPANY

401 N. BROAD STREET
PHILADELPHIA 8, PENNSYLVANIA

In Canada: International Resistance Co., Ltd., Toronto, Licensee

Wherever the Circuit Says Ω.

104
Plasticon Hivolt Supplies

High Voltage—Low Current DC Power Supplies for
Television—Radiation Counters—Photoflash Devices—Electrostatic Precipitators—Spectrographic Analysers, Oscilloscopes, etc.

Hivolt Supplies are self-contained in hermetically sealed metal containers. They are designed to transform low voltage AC to high voltage-low current DC.

### HiVolt PS-2

**SPECIFICATIONS:**
- Volts Input: 118 VAC, 60 cycles.
- Volts Output: 2400 VDC, maximum.
- Current Output: .005 Amps. DC, maximum.
- Max. Watts Input: 10 watts.
- Type of Filter: RC Filter: 50,000 ohms, 2x.1 mfd.
- Terminals: 8-32 screw and nut.
- Insulators: 118 VAC—2 bakelite washers; 2400 VDC—2 porcelain standoffs; container neutral.
- Container: Terne plate steel—gray lacquer finish.
- Size: 3¾" x 3½" x 5½".
- Weight: 2.5 lbs.

**LIST PRICE** $25.75 F.O.B. CHICAGO

Note: The PS-2 is similar in appearance to the PS-1 except that all four terminals are on the recessed top of the container.

### HiVolt PS-1

**SPECIFICATIONS:**
- Volts Input: 118 VAC, 60 cycles.
- Volts Output: 2400 VDC (capacitor load)
- Current Output: .006 Amps., half-wave DC.
- Type of Filter: Not filtered.
- Terminals: 8-32 screw and nuts.
- Insulation: 118 VAC—2 bakelite washers; 2400 VDC—1 porcelain standoff; 2400 VDC—lug spotwelded to case.
- Container: Terne plate steel—gray lacquer finish.
- Size: 3¾" x 3½" x 5½".
- Weight: 2.2 lbs.

**LIST PRICE** $18.95 F.O.B. CHICAGO

Note: The PS-1 is designed to charge a parallel-wired bank of not more than 15 AOCOE22C3 Plasticon Energy Storage Capacitors (48 mfd.).

### Plasticon Photoflash Capacitor

Due to weight and size limitations, it is accepted practice to over-rate capacitors for intermittent photoflash use. This leads to frequent failures and costly replacements of large multi-section capacitors. Plasticons are made in individually cased units which cost no more, weigh less, and take up only 5-10% more volume than multi-section blocks.

**SPECIFICATIONS:**
- Catalog No.: AOCOE22C3.
- Watt seconds: 7.6.
- Capacitance: 3.2 mfd.
- DC Operating Volts: 2250-2400V.
- Duty Cycle: Intermittent.
- Terminals: 8-32 screw and nut; one bakelite washer insulated; can grounded.
- Container: Terne-Plate Steel.
- Size: 2½ x 1¼ x 4¼.
- Weight: ½ lb.

**LIST PRICE** $4.95 F.O.B. CHICAGO

Note: Plasticon Photoflash Capacitors are made from 1600 to 5500 volts and up.

---

Condenser Products Company

1375 North Branch Street • Chicago 22, Illinois
MORE POWER
-BUT 50% SMALLER
UNITED
Z-225/866-A
MERCURY RECTIFIER

Filament Rating 2.5 Volts—5 amps.
Voltage Drop . . . 10-15 Volts
Condensed Mercury Temperature
Range 25 to 60 degrees C.
Supply Frequency up to 150 cycles
Max. Peak Inverse Voltage 12,000
Max. Peak Plate Current 1.0 amp.
Average Plate Current 250 mgs.
Max. Overall Dimensions Height . . . 5½” Width . . . 1¼’

SANTA CLARA VALLEY — SCM, Roy E. Pinkham, W6BPT — Asst. SCM, Geoffrey Almy, 6TBK, RM: CIS. PAM: QLP, WNI makes BPL with a good traffic total. He has returned to work for PAA so has to give up his schedule with IAW. QRI still is working DX, six countries now. W1ZDQ, working DX, has U6AQ, giving him a total of 122 countries postwar. YHL is active on 144 Mc. from Redwood City. TBK has heard the East Coast on 50 Mc. using a converted DM-38. U6NO has returned to the section and plans to go to San Jose State College. FBV is planning another DX-concert and the operating were the Gatti-HallLaufers Expedition to Africa. Bob reports Y3Z now is in Saudi Arabia. RFF is on 14- and 28-Mc. phone using a pair of 5077s as Class B modulators. ZZ now is using a separate HRO for 28 Mc. and an HRO-7 for the 14-Mc. band. WJM sends in a nice report of the traffic handled by the gang around Salinas. He will clear traffic going south and can be found on 3095 kc. Mondays through Fridays at 8 P.M. MFH has a broadband converter going on 50 Mc. and has heard the East Coast. JWS, DVR, GCM, GCI, and BPT enjoyed the opening of 50 Mc. to the east and had many good contacts during the first week in November. KG is building crystal-control exciter for 144 Mc. CFK enjoyed a week’s vacation in Southern California. Thanks, gang, for the FB report sent in this month. Traffic: W6WNI 536, WJM 84, NNX 37, WSH 16, DZE 11, ZZ 11, SYW 7, RFF 6, CIS 2.

EAST BAY — SCM, Horace R. Green, W6TI — Asst. SCM, C. P. Henry, 6B3A, BEO: QJ: AK2, AHW, EHS, NNB, IT, IDY, QDE, WGN, Asst. EC u.h.f.: OJU, RM: ZM. On Nov. 7th the Richmond Radio Club was host to the Mt. Diablo Radio Club in the Richmond City Hall. On Oct. 28th the Oakland Radio Club was host club at a special meeting held for 1BUD, who gave an FB talk on ARRL and RB, who gave a talk and demonstration on 144-Mc. equipment. On Oct. 9th the Northern California DX Club held its anniversary meeting. TT now has a 144 postwar countries. TT was 1st Northern California station to receive his postwar DXCC certificate. FDR has new antenna up and has new final with pair of H355A. RMM has new beam direction indicator that works FB. EFA added six new countries to his list this month. QFH says it looks like his beam will stay up this time and is sure putting out a FB signal. YDI is active on Mission Trail Net. LNZ reports DX only fair. CB is going after DX in a big way. MEMBER has new wave meter and added six new countries this month. BUY is worrying about antennas at his new QTH, 2.1 miles from Walnut Creek. PB reports new final with p.p. 250THS working FB. WP can now hear Europeans with his new NO.173 receiver. RM has new 6A tetrode. LEQ received his prewar ‘phone DXCC Certificate. UPV is chasing 28-Mc. QSOs in his car. ABD is using ART-13 as driver for his final. IDY has new final with p.p. 250THS. EE is getting lots of good DX. IDY, WBJ, WXT, N2, CTF, and WSLP is on for DX. FXX is getting some good QSOs with VXS on 28-Mc. ‘phone. GEA likes his HQ-129 very much. EY says the top of his house now looks like an antenna farm, nothing but wires. BF is back on the air on 3.85-Mc. ‘phone. CAN is putting out an FB 14-Mc. ‘phone signal. The 50-Mc. gang have been having a field day of late working plenty of East Coast boys, one station working 18 in one evening. MLZ reports that during the Navy Day program KCB, IOX, WN, CMN, 7BED, and 7AFR took the but to the top of the traffic count. Most of the traffic came from YTL at Mare Island, MLZ, one of many outlets, was kept busy for two days. Traffic: (Aug.) W6RMN 8, (Oct.) W6MLZ 1065, ZZ 61, FDR 47, KEK 16, YDI 13, IF 10, RMM 7, RIA 5, LMZ 2.

SAN FRANCISCO — SCM, Samuel C. Van Liew, W6NL — Phone JU 7-6457. FZG is working hard to complete 50-Mc. rig. QTH will be 500 feet from P.G.&E. sub-station. IRZ is getting all set with 5077 rig on 7 Mc. GFW lost a pole in recent rain storm. In recite rain set up again, one due to an ambitious truck. VRT worked his ZL on 7 Mc. along with an LU on the same band. NLQ is on 3.85 Mc. with 16 watts and a new half-wave doublet for same. He also is pounding it out on 7-Mc. cw. with the 200Watt rig. RSI and BDV are very active on 28-Mc. n.f.m. CWR, of Eureka, sends in the following from that area: ZKZ is rebuilding and looking for high voltage transformer. CWR is planning new rig. NA0 now is operating f.m. The Humboldt Amateur Radio Club is congestion-free with a

(Continued on page 108)
Be Right with OHMITE AMATEUR ITEMS

Accurate—Dependable—Long Lived

Wire Wound Resistors

Ohmite offers a complete line of dependable resistors wound on a ceramic tube and protected by vitreous enamel. Ratings from 5 to 200 watts. Available in the fixed type for general use, and in the "Division" type with adjustable lugs for use as a multi-tap resistor or voltage divider. Many standard types and mountings.

Composition Resistors and Potentiometer

"Little Devil" resistors are individually marked. In ½, 1, and 2-watt, ± 10% tol. Also ± 5% in ½, 1-w watts. RMA values, 10 ohms to 22 megohms. Type AB, 3-watt molded element potentiometer for industrial use. 50 ohms to 5 megohms in linear taper.

Both items sold only through Ohmite distributors.

All Ceramic Tap Switches

Available in 10 sizes, ranging from 25 to 1000 watts, in a wide range of resistances. Ceramic parts insulate the shaft and mounting. The resistance winding is permanently locked in vitreous enamel. The metal-graphite brush provides unmatched smoothness of action. Engineered and constructed for long, trouble-free life.

Non-Inductive Resistors

Used as dummy antennas for radio transmitters, load resistors in high-frequency circuits, terminating resistors for radio antennas. Vitreous-enamel type wound on a tubular ceramic core. Dummy antenna units consisting of several resistors arranged concentrically, connected in parallel. Sizes: 50 to 250 watts.

Radio Frequency Plate Chokes

To adequately cover higher radio frequencies now used by amateurs, police, and other communication facilities. Single-layer wound on low power factor stratitic or molded plastic cores and covered with a moistureproof coating. Seven stock sizes from 3 to 320 megacycles. Two units rated 600 ma; all others 1000 ma.

All Ceramic Tap Switches

A popular switch for use with tapped transformers in power supply units. Compact, dependable, and convenient to operate. Available in ratings of 10, 15, 25, 50, and 100 amperes. A.C. Contacts are of the silver-to-silver, non-shorting type. Switch shaft is insulated by a strong ceramic hub. Ceramic body is unaffected by arcing.

Write for Catalog No. 19
Provides useful data on the selection and application of rheostats, resistors, tap switches, chokes, attenuators, and other components.

OHMITE MANUFACTURING CO., 4863 Flournoy Street, Chicago 44, U. S. A.

OHMITE

RHEOSTATS  RESISTORS  TAP SWITCHES  CHOKES

107
BUILD A 1/2 KW RIG
(Phase NFM and CW)
FOR ONLY 75c PER WATT

"Buck" Stretcher KIT

SUN RADIO'S
PA-500
only 36 3/4" tall

- Bandswitched R.F.
- Power Supply
- NFM ECO Exciter
- Relay rack
- Illuminated meters


OTHER FEATURES


SUN RADIO & ELECTRONICS COMPANY
122-124 DUANE ST. - NEW YORK 7, N.Y. - B. Barclay 7-1840

steadily gain in membership. EYY is all set for the coming winter DX season, having revamped the shack and operating position. He had a personal visit from the US Navy. He was very much impressed with ham doings. MHI is looking for schedules on 7- and 14-Mc. c.w. His DX total now is 133 postwar stations. JDF, now at the University of Minnesota, is operating a pair of Eimac 250TH tubes running a California kw, on 14-Mc. c.w. Art has been assigned the call DSP for the Department of Military Science and Tactics at the University of Minnesota. RBQ has a new 70-ft. steel power pole with a 14-Mc. rotary beam on top, which works out fine from all reports. Bill also has a new Collins receiver and between getting acquainted with it and the new rotary he is plenty busy. He is running for DX in earnest now and plans to give the gang plenty of competition. Now comes the DX season and most of the boys are busy getting the last drop out of their rigs and looking forward to the coming contests. The Marin Radio Club members have a net going now on 29-Mc. Join in the fun. The San Francisco Naval Shipyard Amateur Radio Club put on a PEL and Vintage Navy Day at the Hunters Point Navy Yard. An amateur station was installed with emergency equipment on both 144 and 7 Mc. Traffic was handled throughout the day between Oct. 6th and Nov. 7th. ATW's official bulletins are transmitted on 3.9 Mc. Traffic was handled throughout the day between Oct. 6th and Nov. 7th. ATW's official bulletins are transmitted on 3.9 Mc. Traffic was handled throughout the day between Oct. 6th and Nov. 7th. ATW's official bulletins are transmitted on 3.9 Mc. Traffic was handled throughout the day between Oct. 6th and Nov. 7th. ATW's official bulletins are transmitted on 3.9 Mc. Traffic was handled throughout the day between Oct. 6th and Nov. 7th. ATW's official bulletins are transmitted on 3.9 Mc. Traffic was handled throughout the day between Oct. 6th and Nov. 7th.
The authorization for wider use of Narrow Band Frequency Modulated phone emphasizes an important problem in frequency control. On NBFM freedom from drift is absolutely essential if you want to "stay in" the other fellow's speaker. On AM it takes considerable drift to put you out of audio range, because your whole carrier is relatively undistorted. With NBFM it's different. Your speech is intelligible on the average receiver ONLY a few hundred cycles at each edge of your carrier. If you drift a little the receiver goes into the "mush" at the center of your carrier or out of your carrier entirely. If you're going Narrow Band use PR Precision CRYSTALS. They're truly low drift... less than 2 cycles per MC per degree Centigrade. Many AM stations avoid working FM stations because of the drift problem. PRs will make you popular with your QSOs. — Petersen Radio Company, Inc., 2800 W. Broadway, Council Bluffs, Iowa. (Telephone 2760)
Available now!

13-CHANNEL FRONT END
I.F. PICTURE AND SOUND STRIP

TELEVISION ASSEMBLIES

- Licensed by RCA
- Factory-wired, tested, tubed, and aligned

Complete Front End and I.F. Picture & Sound Strip

$117.90

Built 10", 12", 15", and 20" direct-view or projection-type television receivers with these sensationally low-priced assemblies. All components are well-known standard brands and guaranteed to operate when simple directions are followed.

FRONT END

Completely wired for all 13 TV channels, from 44 to 88 Mc. and 174 to 216 mc. Channel Selector and Sound Sensitivity all on one shaft. 300-ohm antenna input. TUBES: 6J6 Am. Plifier. 6J6 Converter. 6J6 Oscillator. Size 2¾" x 3" w. x 7½" h.

$39.50

I.F. PICTURE AND SOUND STRIP
(Patents Pending)

ALL FOLLOWING CIRCUITS AND TUBES CONTAINED ON ONE CHASSIS: (1) PICTURE I.F. STAGES — 2 stages of amplification and 2nd detector at 36.1 Mc. (2) SOUND I.F. STAGES — 2 I.F. stages with limiter and discriminator at 21.6 Mc. (3) VIDEO STAGES — 2 stages of Video with a frequency response of 4.5 Mc. (4) ONE D.C. RESTORER (8) 13 TUBES. (6) SIZES: 1¾" x 1½" w. x 2 ¾" h.

$87.50

51 sq. inch PICTURE ASSEMBLY complete with 12 tubes, 12" om speaker, and dipole antenna....

$224.91

75 sq. inch PICTURE ASSEMBLY complete as above, with larger picture tube

$254.31

Liftings on this page represent only a fraction of the huge stock of television parts and components that are available for immediate delivery at Peerless-low prices. Write for current price sheet.

MINIMUM ORDER $2.00

All prices F.O.B. Jamaica, N. Y. Please add postage.

Write Dept. D

Peerless RADIO DISTRIBUTORS, INC.
92-32 Merrick Road, Jamaica 3, N. Y.
Branch 71 Murray Street, New York 7, N. Y.
Are either active or potential users of Astatic Crystal and Dynamic Microphones

THE Astatic Corporation, long interested in Amateur activities, feels very conservative in venturing a guess that far in excess of one-half of all Amateur Operators are using an Astatic Microphone in preference to any other type. Astatic does know, definitely, however, that many of America's foremost Hams . . . outstanding veteran Amateurs with international recognition . . . prefer and use Astatic's time-tested and proven Model D-104, speech range type, Crystal Microphone. This is the highest recommendation any manufacturer could ask and must naturally have an influence with new-comers to the amateur field in their selection of the most practical microphone for the rigs of which they are so proud.

See Astatic Microphones at your Radio Parts Jobber's

In keeping abreast of the times, you will be well repaid by frequent visits to your Radio Parts Jobber's, now showing the newest products in the constantly growing field of electronics.

Many Hams use a microphone mounted, as illustrated, on Astatic's Grip-to-Talk Desk Stand with relay operating ON-OFF switch for remote control of transmitters and amplifiers.
THE Radio Amateur's Library

THESE ARE THE PUBLICATIONS WHICH EVERY AMATEUR NEEDS. THEY FORM A COMPLETE REFERENCE LIBRARY FOR THE AMATEUR RADIO FIELD; ARE AUTHORITATIVE, ACCURATE AND UP TO DATE

Title          Price
QST.............  $3.00 per year*  
Operating an Amateur Radio Station—Free to members; to others...10c  
The Radio Amateur's Handbook, $2.00**  
The Log.............. 50c  
How to Become a Radio Amateur....25c  
The Radio Amateur's License Manual...25c  
Hints & Kinks for the Radio Amateur....50c  
Lightning Calculators:  
a. Radio (Type A)..........  $1.00  
b. Ohm's Law (Type B).....  $1.00  
A.R.R.L. Antenna Book......50c  
The Minilog.............. 25c  
Learning the Radiotelegraph Code..25c  
A Course in Radio Fundamentals..50c  

*Subscription rate in United States and Possessions, $3.00 per year, postpaid; $3.50 in the Dominion of Canada, $4.00 in all other countries. Single copies, 35 cents.

**Postpaid in U. S. A. Proper—$2.00, postpaid, elsewhere. (No stamps, please.)

The American RADIO RELAY LEAGUE
INCORPORATED
WEST HARTFORD 7, CONNECTICUT

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, Glen Bond, W6QTY — GIB, who lives in the Black Forest near Colorado Springs, is back on the air after a wait of 18 months with a 610 on 7-Mc. o.w. SGG will be glad to take traffic for relay to the South. Otto has a 55-watt rig on 7-Mc. o.w. LZY is handling more traffic now and will have more power soon. FQG, in Las Junta, is on 3.85-Mc. 'phone every morning with the Coffee Club and each evening with the Brown Jug Club. AZP and OWP, in Brush, are conducting a class in theory and code. OWF can be heard after every morning and evening in the Pioneer Cup and Brown Jug Clubs. QDC is rebuilding, putting everything in a 6-foot rack. Here is some dope on the Bell Club: SAY is on 14-Mc. o.w. JRO is building a kw. rig. AGB is on 28-Mc. 'phone with a beam. WEM has a new lamp and NFT is doing good within a ten-mile radius of Denver on 3.85-Mc. 'phone. ACA is having oscillator trouble and has burned out his keying relay. VJF is watching the 50-Mc. band as it has made some good contacts. VCG has a new donor for an exciter on 28-Mc. driving its TS5. 1XM worked Holland on his home rig but could not be heard on the mobile rig. Traffic: W6FPZ 32, QY4 41, LZY 19, OWP 10, PCX 5.

UTAH-WYOMING — SCM, Alvin M. Phillips, 87WNP — The USAC is conducting successful 144-Mc. hidden transmitter hunts. TAR is working 14-Mc. DX with his Signal Shifter and folded dipoles. JEC has new 28- and 14-Mc. beam. PFA and USAC now include CRL, CIR, and OAD. New USAC officers are TAR, JQU, and ICZ. GBB is moving traffic on Pioneer Net, FARM Net, and a trunk line and soon will have his new 2500-watt final going. KTY, using an 80-w., is working a lot of traffic and is planning a Rhode Island and QSO for WAS. UTM will QX3 6300 kc. at 7:30 nightly for Utah stations to help him out with his Utah traffic. Recent appointments are as follows: RM to GBH, QRZ to UTM, SDC to JQF. Congratulations, fellows. Let's realize that the new section Emergency Coordinator will need the cooperation of all. A. L. Budlong held meetings at Cheyenne and Salt Lake City to explain the workings of the frequency allocation machinery and its results. At the Shy-Wy meeting CIB won the BC-375 door prize, donated by BAH and ICZ. KEZ has transferred to San Francisco. JFU is enjoying his 120 watts and new four-element 14-Mc. rotary beam. LFT is lining up a net for Northern Utah. Traffic: W7KIY 90, GBB 87, UTM 38.

SOUTHEASTERN DIVISION

ALABAMA — SCM, Arthur W. Woods, 84GWJW — AUP attended Cracker Net meeting at Cookeville, Ga., on Oct. 19th, and is building new portable rig. EPE is running 180 watts to a pair of 3C626s on 14 and 7 Mc. FMZ works 7 and 28 Mc. and submitted his OPS for endorsement. MBD is becoming interested in Emergency Corps work. DMV is working plenty of DX on 14 Mc. with 75 watts. ATF and HJJ attend Rebel Net meetings regularly. IKK has been heard on 'phone recently. ELX is finally going e.c.o. KUX visited MBM and Pensacola and has made up his mind to buy a push button controlled all-band transmitter. RM is on 3.85 Mc. MKV is on 28 Mc. IAT is working good 14-Mc. DX. IMK is working 7 and 14 Mc. QJG visited M8. GBB, and Pensacola, and has a pair of HK24Gs at Vulcan Club Halloween Party. MSF and EPW, in Pensacola, are conducting a class in theory and code. 144 to 3.85 Mc. BLY is on 7 Mc. KFG is on 14-Mc. 'phone and c.w. FSW is on 144 Mc. GJC is on 28 Mc. Traffic: W4OUF 21, EPE 3.

The American RADIO RELAY LEAGUE
INCORPORATED
WEST HARTFORD 7, CONNECTICUT

(Continued on page 114)
Model 666HH
VOLT-OHM-MILLIAMMETER

Here it is! The NEW "hand-size" Triplett tester that packs a laboratory of versatile service into a size that fits your hand and weighs only 1 1/2 pounds. It's the tester you've been looking for.

In a handsome, streamlined, molded case, Model 666HH features greater scale readability; low contact resistance at jacks achieved by new banana-type plug-in leads; greater stability evolved through special new type resistors — these are just a few of the many refinements.

Model 666HH is an engineered marvel of compactness, a miniature "laboratory" that delivers more accurate, precise results per square inch than many kinds of larger, more costly equipment.

See, try, compare the brilliant performance of this thorough-going example of dependable Triplett engineering. It's the ideal tester for radio servicemen, radio amateurs, industrial engineers and laboratory technicians.

For Descriptive Material Write Dept. J18

TRIPLETT ELECTRICAL INSTRUMENT COMPANY, BLUFFTON, OHIO
NEW! in 1,000 pages

Radio Data Book

All data and basic knowledge in radio and electronics digested into 12 sections... in a complete, quick to find, easy to read, handbook form.

Plan every operation in radio and electronics with the Radio Data Book. This new radio bible will be your lifelong tool... you will use it every day, on the bench, at the beach, in the field! Use it for construction, troubleshooting and testing. The Radio Data Book will be your indispensable aid in design, experiment and in layout. It will help make your production better, faster and easier. In any and every operation in radio and electronics, you will use the Radio Data Book!

The Radio Data Book is a work of complete authority, prepared by engineers with many years of practical experience. They have been assisted by the Roland & Boyce staff of editors skilled in preparing electronic manuals for the U. S. Signal Corps for many years. These men have worked for several years gathering material for this book... all the knowledge of radio principles and operation... all the statistics... all the newest developments in electronics... every possible angle and detail. Eighteen months were spent digesting this material into the most concise, the clearest, and the most readable form. The result is this invaluable manual... The Radio Data Book. Whether you use this book for general reference, for scientific instruction, or for education, one thing is certain—the practical help, the daily usefulness you will derive from it will prove to be worth many, many times its astonishingly low price!

Advanced Sale... first printing. Only 10,000 available... To make sure to get your Radio Data Book, mail your order now!

12 sections... 1000 pages... Completely Illustrated

Section 1. The 150 Basic Circuits in Radio
Section 2. Testing, Measuring and Alignment
Section 3. All About Antennas
Section 4. Charts, Graphs and Curves
Section 5. Codes, Symbols and Standards
Section 6. Complete Tube Manual
Section 7. Electronic and Physical Characteristics of Radio Components
Section 8. Complete Wire Manual
Section 9. Complete Transistor Manual
Section 10. Dictionary of Radio and Electronic Terms
Section 11. Radio Book Bibliography

12 complete books in one only $5.00! Less than 42¢ per book!

MAIL THIS COUPON TODAY!

Boland & Boyce Inc., Publishers
400 Bloomfield Ave, Montclair, N. J.

Please send me THE RADIO DATA BOOK Enclosed is $5.00.

NAME

ADDRESS

CITY

STATE

HWA has gone mobile on 27 and 28 Mc. with Silver and Con-Set gear for QSOs while traveling around the State. Miami: They dood it again! Now it's a 14-year-old YL ham, MXP. Brooksville: MNT, 13 years old, takes 20 w.p.m. and asks about traffic net. Orlando: CPG is the prime mover in the state-wide 144-Mc. roundup. Get behind this fellows, for greater activity on 144 Mc. Palatka: The ARRL b.c. radio script was presented over the KKe Net from QR. It was well presented, thanks to EVB, OCD and QR. Universal CQ? AVY reports 4000 locals in the last CO Contest. Please, gang, let's have more activity in the CD and LO Contests. LCZ, on 3875-kc. c.w. net and rag-chew spots, has only battery-powered generator at his signal post. The SCM hollers, send activity reports on the first of each month.

Traffic: W4XC 200, DQW 204, BT 81, 9V7 71, AAR 65, JYG 18, FWZ 12, GHP 12, JQ 12, LXX 9, IJLI 6, LCZ 5, MKP 2.

Western Florida—SCM, Luther M. Holt, W4D6—RM: AXP. The Peninsula Emergency Corps made a broadcast of a simulated emergency over WBSR, the purpose of which was to acquaint the public with emergency work being done by local amateurs. MOB made a new Peninsula call. LRC is on 23-Mc. 'phone. SFH/4 is set for 43 MHz. SNIS in the Navy at Peninsula. DLO is new OQ. AXP has a r-b-q. GTI has low power on 7 Mc. MDQ has 20 Mc. EGN, DZX, and DAO work 14-Mc. 'phone. DXQ keeps 7 Mc. hot. QXN was transferred to another Naval base. MFT visits Peninsula almost weekly. Members of the Peninsula Emergency Corps include KIP, JV, EQB, DXQ, JGW, EERT, LCY, HIZ, MOB, HCC, CKN, and others. MEN is building new e.o.o. EQS is building new three-element beam, also portable a.c. power plant. QB built butterfly condenser. JZ moved into new home. PDL works 28 Mc. LRX is new OBS. ACB visited the Peninsula gang.

Traffic: W4AXP 38.

Western Indies—Acting SCM, Everett Mayer, K4PKD—NY4CM has 1200 w.a. and is up to 155. K4PKM and JTQ are on 38 Mc. worked C in IRZ with 200 watts. On 28 Mc. Roger worked HCIKP for a new country. BE QC0D with 12 watts 'phone. DV has 1 kw, for 7 and 14 Mc. c.w. and 500 watts for 14- and 28-Mc. 'phone. AC put 2 watts on 28 Mc. with indoor antenna and worked locals. Roberto has his new HQ-129X. FN and AC got mixed up with 220-volt a.c. line while putting up antenna for FN. BJ worked ZC0 for a new country. FP and ZV are active on 28 Mc., FP with Meek and H with Globe Trotter. AC now is KV4AT at St. Thomas, V.I. FI is active in Mayaguez. EW has new 28-Mc. rotary beam operating FB. W4LQ/K4P is active on 28 Mc. while in P.R. AK finally got a UA card. KD has 121 countries in 14-Mc. and is active in Mayaguez. The Puerto Rico Amateur Radio Club board is quite active with K4EI, new XYL presxy. Traffic: NY4CM 19, K4PKD 6, DY 4.

Southwestern Division

Arizona—SCM, Gladden C. Elliott, W7MLL—About 600 hams attended the Southwestern Division Convention in Phoenix and had a rip-roaring time. Nearly every city and town in the State was represented and there was a big turn out from California with the W9s taking home a lion's share of the prizes. MAE worked K7PA on 3.85-Mc. 'phone, which is some sort of a record as Ken uses only 12 watts input. JVK has a new four-element rotary to go with his 400 watts. PJD worked MAE for a new country. In the Sierra area, W7NQ has a new Hammarlund rig on 3.85- and 14-Mc. 'phone. SMZ has a kw, on the air with a new TWT transmitter and is working a lot of DX. QNC and UFQ have five-element rotaries on 28 Mc. in Safford. LOC has a new four-element rotary. ROD and KWW are on 50 Mc. OWX worked Newfoundland on 60 Mc. JFG worked all South America on 14-Mc. 'phone with an 8JK antenna. WEOE/7 is on 3.85 Mc. and 7 Mc. in Tucson. PEY worked D4AXS, who was using 8 watts input. PEY reports 82 countries and 7W7 on 20 Mc. get s good reports on n.f.m. with a 318 in the final running 400 watts. New officers of the Old Pueblo Club are: LHD, pres.; LAD, vice-pres.; SMZ, sec-and-treas. JIB had his 28-Mc. mobile stolen.

San Diego—SCM, Irvin L. Emig, W6GCC—Ast. SCM and SEC, Gordon Brown, 8APG. The Arizona section certainly did a fine job in handling the Division Convention. DEY is working 50 Mc. with new condenser but soon will be on 10,000 Mc. with QG, both on at the same time using 800 gear. VJQ, LJD, (Continued on page 116)
Sign of Transformer Reliability

KENYON For over 20 years, the KENYON "K" has been a sign of transformer reliability. Ever since the cat's-whisker, crystal-set days, KENYON has pioneered high quality transformers. Skillful engineering, progressive design and sound construction have resulted in dependable, conservatively-rated transformers with an enviable record for minimum field rejections. Cut engineering and replacement costs. Improve products. Insure repeat business. Specify KENYON!

Consult KENYON About Your Transformer Problems

KENYON TRANSFORMER CO., Inc. 840 BARRY STREET NEW YORK 59, N.Y.

115
and WZL schedule W6YOT/C6. Welcome to new XYL AQ7. The XYLs of VUK and WWU expect their licenses any day. CHV rebuilt final and erected a new 28-Mc. beam. netting three new countries! BGF is active on the Pioneer Net. HAM says DX is so good he has not moved. CNQ sends nice card about doing in Calexico. DWA is moving to new QTH. RDI is working out fine with 9 waits on 28 Mc. ZUR and YXU are going on the air with ATC transmitters. DM-3U has new DM-3S and 200-ke. crystal. AHA is a new call, ROQ works 7 and 16 Mc. when not busy at KYOE. SFK and QG worked 7ACS/K6H on 50 Mc. during recent opening. URS is building his 3.85-Mc. phone into a rack. Next of DX QSL? BAG is on 144 Mc. ZWY is working lots of DX on 28 Mc. with a pair of new tubes. HWJ is active on 3.85 and 144 Mc. RWP has a new Taylor 900-A. FJH, FCI, and ZWL are on 7 Mc. UAB, on Victory Ship QD, expects to work 28 Mc. while on route to Japan. ADT is pounding limes on a large banana boat to Mexico. The Palomar Club has had a fine turn out of 70 amateurs and friends at its picnic. 1BUD, of ARRl, gave an interesting talk on the Atlantic City Conference at a joint meeting. The San Diego YLRL had a luncheon with Miss Diana Tuck, ZS6GHL, as guest speaker. WWU raised power to 300 watts. PFQ worked PK6AA on 3.85-Mc. phone. WXW works three-way with VKS on 27 Mc. YWR is on 7 Mc. YFM is back from Guatemala. FFV has a new rig. Traffic: W5C5F 40, W5ZL 40, BGF 35, VJQ 35, LUS 35, IRL 12, DEY 7, CNO 6, WWU 6, M1 4, YWR 2, ORD 2.

WEST GULF DIVISION

NORTHERN TEXAS — SCM, N. C. Settle, W5DA/S MNL — Asst. SCM, Joe Bonnett, SIII, SEC: QA. PAM: BEE. RM: CDU. LMF, LOI, JQY, and DAS have new Panadaptors. DMF and DAS are using BIS units. 144-Mc. activity continues with DXR, EWI, C2Z, ATX, and DAS. Reports indicate 50-Mc. interest is picking up around the State. The NTX Net complains of not enough traffic while the NTX one-man Trunk Line, 1SN, keeps busy working Rebel Net and TLAP. Nice going, Steve! We are happy to see LO-Nite participation on the increase. Sunday morning EC drill activity continues on 3.9-Mc. phone band. DAA, formerly of Terrell, reports regularly into the North Texas Traffic Net and is working full time in phone and c.w. traffic nets serving Ft. Worth. ISD schedules New Mexico Net. GZU schedules Oklahoma Net. LVR, of Mc Kinney, commutes to Dallas to attend school. FMZ, ILZ, and ASA are active on 3.5-Mc. c.w. CDU keeps Wichita Falls on the active list. HBE, of Dallas, is moving to new QTH. AAK was happy to get a replacement transformer for receiver after a long delay — two days later plate supply transformer went west. OZS and his XYL visited CDU. Contributions for this column are welcomed by your SCM. Please use station activity report cards. How about traffic reports from the net ‘phone stations? Traffic: (Sept.) W5AHT 125, GVS 121, CDU 57, GZU 40, MXV 39, ISD 23, ILZ 20, ARK 16, ASA 13.

OKLAHOMA — SCM, Bert Weidner, W5KHZ — Asst. SCM, George Bird, SHGC. EC: AST. Each month the OLZ bulletin comes in with a lot of good comments and news. OLZ is really a traffic net and will welcome new members. OEPN is on each Sunday at 0830 on 3880 kc. and welcomes new members. This is one ‘phone net that can follow procedure and handle traffic properly. YJ reports into OLZ each night with a different operator. New officers at Stillwater are: LTN, pres.; PW, vice-pres.; MGy, secy.; NDO, treas. NCW is QSL Mgr. Each ham graduating from A. & M. College will be presented with a 7000-kc. crystal and the club will monitor the frequency at all times. NMM is on in Oklahoma City and now is a member of OLZ. IGO, on a trip to New Mexico, kept reports with IHU and AIT. IHU left for CAA post in Alaska. A new club has been organized at Tinker Field with the call NEG, and is giving code lessons to a number of interested persons. EHO still hopes to get his 813 rig on the air. AI has developed a folded 14-Mc. beam that is only slightly longer than the 30 Mc. His results are equal to the conventional beam in every way. The simulated emergency was a great success where ever on. IHU wounded a plate transformer for EHC bringing him nearer to getting his rig on the air. Traffic: (Sept.) W5AHT 125, GVS 59, IGO 57, PFP 29, ADC 16, JRS 13, EHC 7, IOW 5. (Oct.) W5AHT 164, IGO 97, KSJ 27, PFP 22, HTK 26, NMM 14, PA 9, ADC 5, PPR 7, EHC 7, HZK 4, IOW 4.

SOUTHERN TEXAS — SCM, Ted Chastain, W5HTF (Continued on page 118)
If it's Radio... HARVEY has it!

Millen 90700 VFO... A favorite frequency shifter, plug in in place of your crystal for instant, finger-tip control of carrier frequency. Extremely low drift. Chirpless keying. Vibration immune. Large bandspread dial, accurately calibrated. Complete with tubes.............................................. $42.50

Millen 90800 Exciter-Transmitter...
Based on an original Handbook design, this popular 50-watt Exciter-Transmitter is ideal for use as a low power transmitter or as an exciter for high power transmitter stages. It uses a 6L6 and 807. With coils for 10 meters, less tubes.............................................. $42.50

Millen 90881 RF Power Amplifier...
This 500-watt amplifier may be used as the basis of a high power amateur transmitter or as a means for increasing the power of your present transmitter. Wired for use with two 812 type tubes, but may be used with TZ40's, 35T's, 812H's, HF100's, HK54's, etc. Plug-in coils are available for all bands 10 through 80. The Millen 90800 exciter is an ideal driver for this amplifier. Complete with one set of coils, less tubes................... $89.50

Millen 90810 HF Transmitter...
A crystal controlled unit for 2-6-10-11 meters. Rated 75 watts output. Uses a 6AG7 crystal oscillator in the new Billey CCO-2A crystal unit, 2E26 tripler and 829B power amplifier stage. For 10-meter operation a conventional crystal is used; for 6, an overtone crystal is used; for 2, the overtone crystal drives the 2E26 tripler. Transmitter is normally supplied with grid and tank coils for 10-11 meter operation. Coils are available for 2 or 6 at $3.60 per set. Transmitter complete, less tubes............... $69.75

Millen 90281 Power Supply...
This unit is rated 700 V. DC at 250 mils, completely filtered. Also supplies 6.3 volts AC at 4 amps. Unit is designed for use with transmitters such as the Millen 90800, 90810 or any other transmitter or laboratory purpose requiring this power. It uses two 816 rectifier tubes and has a 2-section pi filter with 10 henry GE chokes and a 2-2.10 mil, bank of 1000-volt working GE Pyranol capacitors. Complete less tubes............................................ $84.50

The staff and management of Harvey Radio wish you a Merry Christmas and a Happy New Year

Telephone: Longacre 3-1800

NOTE: All prices are Net, F. O. B. NYC and are subject to change without notice.
NC-183...Another New "National" Now Ready!

In our opinion the NC-183 is one of the finest receivers that National has produced in many years. It covers 50/60 cycles. There's no better buy for $269.00.

NC-173 –...-·············“··································•········· 189.50

NC-57

NC-46

NC-2-40D ........................................................... $241.44

NC-1-10A (less speaker and power unit) .............. 67.50

In-built power supply for 110/120 or 220/240 volts. A completely self-contained precision tester for general amateur station use.

SIMPSON HAMMETER

Model 240

This brand new army surplus transceiver contains practically all of the elements you need to get going on VHF.

RT-7/APN-1 ALTIMETER TRANSMITTER

BGG has new Meissner Signal Shifter and HQ-129X rotator for modulators. All c.w. stations who are interested in joining the South Texas Emergency Net, please contact Dave Harrell, WSCVQ, NCS in Austin. You are needed! Traffic: WSMN 555, LWY 31, JFC 10, HIF 10.

NEW MEXICO — SCW, J. G. Hancock, WSHJF — SEC: AM/211. MNN, club station at the Roswell AAF was operated at the Eastern New Mexico State Fair and handled 335 messages for fairgoers.

MARKETERS, Inc.

W/W 595, LWV 31, JPC 10, HIF 10.

ELECTRONIC MARKETERS, Inc.

190 VARICK STREET, NEW YORK 14, N. Y.

Phone: WAtkins 4-9488

(Continued on page 190)

Of course, you can’t plan your future on a slide rule. But you can figure out why the radioman who looks ahead will get ahead. Look at the successful radioman. You’ll find that he’s the fellow who looked and planned ahead. Today, as a member of the great radio-electronics industry, you have the same opportunity — and few men have ever enjoyed such favorable conditions in the past. Your future success can be assured by the plans you make today. Just figure out for yourself how many good jobs are waiting for good men to fill them. These men must have necessary modern training to handle intricate present day equipment. You can’t say, “I don’t need more training.” Every radioman needs more training to increase his technical knowledge, no matter how limited or how great his experience.

No matter what your experience in radio -- CREI has a course for you. You will find our courses offering down-to-earth, practical training for any man who wants to improve his ability and his chances for advancement. You can “go all the way with CREI” from introductory basic principles to advanced training and on to specialized fields of radio-electronics.

Send for and read our 24-page booklet that explains our self-improvement program, our courses and what we can do for you. If you write now, we’ll also send a free typical lesson for your inspection. It will give you a good idea how practical and easy-to-understand our training is. There’s no cost or obligation.

VETERANS! CREI TRAINING AVAILABLE UNDER THE “G.I.” BILL

Capitol Radio Engineering Institute
An Accredited Technical Institute
DEPT. Q-1, 16TH AND PARK ROAD, N. W., WASHINGTON 10, D. C.
Branch Offices: New York (7) 170 Broadway • San Francisco (2) 790 Market Street

FREE SAMPLE LESSON
Now, see for yourself! Read one of these interesting lessons from the CREI course. You will see, in advance, how practical it is to improve your ability the CREI way.

From Practical Radio-Electronics Course:
"Electron Physics and Electron Theory"—Discusses modern theories of the composition of matter, including atomic energy, and their relation to present-day radio-electronics.

From Practical Television Course:
"Pick-up Tubes—Iconoscope and Image Dissector Tubes”—Discusses fundamental pick-up tubes of the television camera. It precedes the study of the Orthicon and the Image Orthicon.

MAIL COUPON FOR FREE BOOKLET AND SAMPLE LESSON

CAPITOL RADIO ENGINEERING INSTITUTE
16th and Park Rd., N. W., Dept. Q-1
Washington 10, D. C.
Mail me ONE FREE sample lesson and your 24-page booklet, "CREI Training for Your Better Job in Radio Electronics.” I am attaching a brief resume of my radio experience, education and present position.

Check [ ] Practical Radio-Electronics
[ ] Practical Television

Course

Name: ________________________________

Street: ________________________________

City: ____________________ Zone: ______ State: ______

[ ] I am entitled to training under the “G.I." Bill.
ONTARIO DIVISION

ONTARIO — SCM, David S Hutchinson, VE3DU — The Beaver Net is in full swing and the Ontario 'Phone Net is going strong on 22 stations, ATR is strong on BN and schedules WINJMJ. AWJ is rebuilding. LA is new 3.5-Mc. man in Windsor. BHE, BOL, AVJ, BQG, ADN, AHL, and BIW are active on 144 Mc. in the Windsor area. The Peterboro ARC is trying to arouse local interest in 144 Mc.BQJ has Belleville-Trenton-Plcott 50-Mc. net going and prospective Kingston hookup, GT is active on 7 and 14 Mc. KM is busy on 3.8-Mc. 'phone and 50 Mc. The Hamilton Club had an emergency test on Oct. 10th. VD is active on 7 and 14 Mc. BAJ finally got down and made first QSO on 3.5 Mc. BCP is new call at the Papgwa Radio Range. HF is in and big in the city after a sojourn in Port Arthur. RX is on 14-Mc. 'phone. ATO, AVJ, BBG, and BDN are active on 7 Mc. REJ, AMQ, AVJ, BDN, and BQR are working 14 and 28 Mc. AMQ, AVJ, and BAV are getting out on 50 Mc. AVN and AWC have new all-band 'phone-c.w. rigs. BAX is on 144 Mc. BMM is working 3.5, 7, and 28 Mc. BQR has new 811 on 14-Mc. c.w. BOP is on 50 Mc. with 8AG7 oscillator, GFO into an 813. EF is on 3.5, 7 and 14 Mc. with new rig using 811 final and Mix VFO. The Kirkland Lake gang had an FB hamfest on Oct. 4 and 5. Feature speaker at the banquet was our genial CGM, 2BE. The London Radio Club had a large social evening Oct. 30th. AIB, of Toronto, is now AE7. VESKM. QB is new OBS. Plans are under way for VE3 participation in Trans-Canada Trunk Line "I" with several BN boys ready to take their turn. All the Beaver Net boys soon will be OBS. Anybody wishing appointment as OBS, OPS, ORS, RM, or EC, send applications to your SCM.

Traffic: VE3ATR 81, BCS 64, XO 58, SF 54, DH 33, WX 31, HP 20, DU 14, BQL 13, KM 10, VD 10, BMG 7, GT 7, BCP 4, AWJ 2, BME 2.

QUEBEC DIVISION

QUEBEC — SCM, Gordon A. Lynn, VE2GL — TF7 has new 25- and 14-Mc. rotary four-element beam on the roof. YG and UL are experimenting on 235 Mc. KG is adding 814 final. WY is working DX on 29 Mc. early mornings. YG has a pair of T40s 300 watts on 28-Mc. 'phone. KD is heard on 28-Mc. 'phone. BE is giving 28 Mc. a whirl. LO continues active on 7-Mc. c.w. PA is active on 3.8-Mc. 'phone. DB is heard on 14-Mc. c.w. 1G has changed QTH to Roberval and is on 3.8 Mc. DY rebuilt modulator and now is using Class B. EC now OP5 and has emergency rig built and ready for use, portable or fixed. ZZ is continuing his effort to whip Emergency Corps into shape with assistance of QQ and TA. BG and BB schedule VK3HF daily. BG has new call at the Pagwa Radio Range. HP, BJ, and KM, of Toronto, are active on 28 Mc. with new rig using 811 final and Mix VFO. The Beaver Net is going again with 22 stations. ATR is on 3.5 Mc. BOP is on 50 Mc. with 8AG7 oscillator, GFO into an 813. EF is on 3.5, 7 and 14 Mc. with new rig using 811 final and Mix VFO. The Kirkland Lake gang had an FB hamfest on Oct. 4 and 5. Feature speaker at the banquet was our genial CGM, 2BE. The London Radio Club had a large social evening Oct. 30th. AIB, of Toronto, is now AE7. VESKM. QB is new OBS. Plans are under way for VE3 participation in Trans-Canada Trunk Line "I" with several BN boys ready to take their turn. All the Beaver Net boys soon will be OBS. Anybody wishing appointment as OBS, OPS, ORS, RM, or EC, send applications to your SCM.

Traffic: VE3ATR 81, BCS 64, XO 58, SF 54, DH 33, WX 31, HP 20, DU 14, BQL 13, KM 10, VD 10, BMG 7, GT 7, BCP 4, AWJ 2, BME 2.

ONTARIO — SCM, David S Hutchinson, VE3DU — The Beaver Net is in full swing and the Ontario 'Phone Net is going strong on BN and schedules WINJMJ. AWJ is rebuilding. LA is new 3.5-Mc. man in Windsor. BHE, BOL, AVJ, BQG, ADN, AHL, and BIW are active on 144 Mc. in the Windsor area. The Peterboro ARC is trying to arouse local interest in 144 Mc. BQJ has Belleville-Trenton-Plcott 50-Mc. net going and prospective Kingston hookup, GT is active on 7 and 14 Mc. KM is busy on 3.8-Mc. 'phone and 50 Mc. The Hamilton Club had an emergency test on Oct. 10th. VD is active on 7 and 14 Mc. BAJ finally got down and made first QSO on 3.5 Mc. BCP is new call at the Papgwa Radio Range. HF is in and big in the city after a sojourn in Port Arthur. RX is on 14-Mc. 'phone. ATO, AVJ, BBG, and BDN are active on 7 Mc. REJ, AMQ, AVJ, BDN, and BQR are working 14 and 28 Mc. AMQ, AVJ, and BAV are getting out on 50 Mc. AVN and AWC have new all-band 'phone-c.w. rigs. BAX is on 144 Mc. BMM is working 3.5, 7, and 28 Mc. BQR has new 811 on 14-Mc. c.w. BOP is on 50 Mc. with 8AG7 oscillator, GFO into an 813. EF is on 3.5, 7 and 14 Mc. with new rig using 811 final and Mix VFO. The Kirkland Lake gang had an FB hamfest on Oct. 4 and 5. Feature speaker at the banquet was our genial CGM, 2BE. The London Radio Club had a large social evening Oct. 30th. AIB, of Toronto, is now AE7. VESKM. QB is new OBS. Plans are under way for VE3 participation in Trans-Canada Trunk Line "I" with several BN boys ready to take their turn. All the Beaver Net boys soon will be OBS. Anybody wishing appointment as OBS, OPS, ORS, RM, or EC, send applications to your SCM.

Traffic: VE3ATR 81, BCS 64, XO 58, SF 54, DH 33, WX 31, HP 20, DU 14, BQL 13, KM 10, VD 10, BMG 7, GT 7, BCP 4, AWJ 2, BME 2.

QUEBEC DIVISION

QUEBEC — SCM, Gordon A. Lynn, VE2GL — TF7 has new 25- and 14-Mc. rotary four-element beam on the roof. YG and UL are experimenting on 235 Mc. KG is adding 814 final. WY is working DX on 29 Mc. early mornings. YG has a pair of T40s 300 watts on 28-Mc. 'phone. KD is heard on 28-Mc. 'phone. BE is giving 28 Mc. a whirl. LO continues active on 7-Mc. c.w. PA is active on 3.8-Mc. 'phone. DB is heard on 14-Mc. c.w. 1G has changed QTH to Roberval and is on 3.8 Mc. DY rebuilt modulator and now is using Class B. EC now OP5 and has emergency rig built and ready for use, portable or fixed. ZZ is continuing his effort to whip Emergency Corps into shape with assistance of QQ and TA. BG and BB schedule VK3HF daily. BG has new call at the Pagwa Radio Range. HP, BJ, and KM, of Toronto, are active on 28 Mc. with new rig using 811 final and Mix VFO. The Beaver Net is going again with 22 stations. ATR is on 3.5 Mc. BOP is on 50 Mc. with 8AG7 oscillator, GFO into an 813. EF is on 3.5, 7 and 14 Mc. with new rig using 811 final and Mix VFO. The Kirkland Lake gang had an FB hamfest on Oct. 4 and 5. Feature speaker at the banquet was our genial CGM, 2BE. The London Radio Club had a large social evening Oct. 30th. AIB, of Toronto, is now AE7. VESKM. QB is new OBS. Plans are under way for VE3 participation in Trans-Canada Trunk Line "I" with several BN boys ready to take their turn. All the Beaver Net boys soon will be OBS. Anybody wishing appointment as OBS, OPS, ORS, RM, or EC, send applications to your SCM.

Traffic: VE3ATR 81, BCS 64, XO 58, SF 54, DH 33, WX 31, HP 20, DU 14, BQL 13, KM 10, VD 10, BMG 7, GT 7, BCP 4, AWJ 2, BME 2.
Here is really superior television performance, with remarkable life-like fidelity of both picture and sound!

TELEVISION ASSEMBLY units are easy to put together and require no alignment adjustments upon completion! These are semi-assembled kits, with both R.F. and I.F. sections supplied completely wired, tested and precision-aligned!

- 10,000 volts second anode potential for better contrast and brightness
- High fidelity FM sound
- Heavy duty RCA 6.8 cc slug Alnico Y 12" FM speaker
- Dipole antenna & 60 ft. lead-in.
- Complete pictorial and schematic diagrams
- Only top quality material used throughout — no surplus.

**TELEVISION PARTS**

IN STOCK — Write for List!

- All Television Tubes
- RCA — DuMont — Rauland

TRANSFORMERS

Large Stocks! Immediate Delivery!

We are authorized distributors for:

- KENYON
- STANCOR
- THORDARSON
- UNITED Transformer Corp.

GUARANTEE — Every item, regardless of its low price, is fully guaranteed by TERMINAL RADIO CORPORATION.

If unable to visit our store, send us your mail orders with 25% deposit. Remit in full all orders under $5.00. Prices are F.O.B. New York.
OST
YEARY BINDERS

Are We Right?

You should have at least two of them—one for your complete 1947 file of copies, and one for each 1948 issue as published.

With each Binder is furnished a sheet of gold and black gummed labels for years 1929 through 1949. The proper one can be cut from the sheet and pasted in the space provided for it on the back of the binder.

Price $2.00 postpaid

Available only in United States and Possessions

THE AMERICAN RADIO RELAY LEAGUE
West Hartford, Connecticut

BW has new rig under way. LG says the free QSLs supplied by the Provincial Government should be out soon. How about some news from the Lethbridge gang?

BRITISH COLUMBIA—SCM, W. W. Steevey, VE7WS—Many of the Collingwood Radio Club boys are starting to rebuild. DU blew up his HK-54 final, then not long after the power section of the new VFO went up in smoke. However, he worked his first VK from his QTH with his buffer. AME is starting his new call, rig, and antenna on 7 Mc. now. Lock for a T9 signal around 7035 kc. That will be Doug. GP is on 7 Mc. KK is the most-heard call on 7-Mc. c.w. Jim gets through QRM FB with a single 6L6. LG is going to work the DX with lots of power. He is getting the rig together somewhere in the neighborhood of a kw. XT is putting out more RF; he is using a pair of 811s and melting the plates on them. MH has not been heard on 14-Mc. c.w. lately so he must be building up that 28-Mc. 'phone rig. 7-Mc. c.w. is getting its share of QRM from HP, who is building up new modulator. OJ has a fine new pole in his back yard. JPE's three-element rotary is down now, either for repairs or something new. YY has lots of room for antennas at new QTH. KW is on 28-Mc. 'phone now and likes it better than c.w. He has another music box REM-60 and also Jane's hi-pitch exciter unit. NY is now on 14 Mc. with 25 watts. TC is working a lot of DX these days. EP has a BC-248Q receiver. UM is rebuilding his 3.85-Mc. transmitter. ME is going to put up a poled dipole. The Totem Radio Club had a fine turnout on Oct. 14th. US puts out official bulletins on 3850 kc. with 300 watts.

PRAIRIE DIVISION

MANITOBA—SCM, A. W. Morley, VE4AM—Congrats to NT on the arrival of a jr. operator, and to NO's XYL, who received her ham ticket. 3.85-Mc. 'phone is very active with JN, at Waskada; XP, at Dauphin; AU, AP, and HD, at Brandon; QG and JM, at Winnipeg. HS at Mission is back on after harvesting and has built a converter for 28 Mc. QD, a new call at Brandon, was SWL prewar and will be heard soon with 813 final. KD, at Neepawa, got his 500-watt goin', thanks to AD. TJ has new VFO, TC has new beam on 28 Mc. FM Fien has EQ on 3.5 Mc. and YM on 7 Mc. FW has new receiver. AP and HD both run ATIs on 3.85 Mc. St. Vital has an antenna bee on with SS, FW, and AM all trying out short antennas for restricted space. Traffic is on the upgrade but no reports are reaching me. Trunk Line "I" is in operation again, as is the AFARS TOT. By the time this appears in print you may have a new SCM. Support him, whoever he is. For your cooperation in the past, many thanks. Traffic: VE4AM 9.

New Books


This book presents an up-to-date exposition of the fundamental principles used in modern acoustics and a description of existing acoustical instruments and systems.


These notes represent an effort to bridge the technical gap between engineers, research workers and inventors generally, and their patent attorneys. Practical suggestions are included for protecting inventions prior to the filing of applications and thereafter.


This book presents elementary principles and practices of radio servicing for vocational-school students, with emphasis on service theory and procedures.
HARRISON HAS IT!  
HARRISON HAS IT!

Here's how!  
For a HAPPIER NEW YEAR!

How?  By getting all of your equipment from me. I guarantee you'll be a happier Ham — this year, next year, always!

73,  Bil Harrison, W2AVA

If you can't visit either of my well-stocked stores, phone or mail in your orders for really superior SERVICE. All standard lines at lowest prices.

Complete TRANSMITTERS
of Highest Quality and Proven Performance
Moderately Priced.

Ready to go on the air! All factory built and tested units with components of newest production. Complete with tubes, coils for one band, and operating instructions. Housed in modern deluxe rack cabinets. Less only crystal, microphone, key, and antenna.

75 WATT. The famous Millen 90800 streamlined crystal controlled transmitter employing a 9Cl oscillator-multiplier and an 807 amplifier. Hundreds now in use giving outstanding performance! Meter indicates both stages. Dependable, well-filtered power supply. Cabinet 19" high. Model 109, 150 Volts, 42-1/2 Amps, $145.

(Comes, per additional band — $3.50)

For VFO control, plug in the Millen "Varifarm" ($42.50 complete) or any other good ECO.

For phone operation plus in a Sonar VX-10 Narrow Band FM unit ($39.45 complete), or use any VFO.

For both VFO and NFM PHONE order the Model PV75 Transmitter, incorporates a Sonar VX680 exciter. Cabinet 191/4" high. $235.

800 WATT. This excellent high power Transmitter is built around the Millen 90800 as an exciter together with the well-designed 90861 pass-buck 800 watt amplifier. Uses the stable, sturdy 12-14 tubes in high efficiency layout. Separate power supplies for the oscillator-pulser and the final for good regulation. Power relay with provisions for remote control. Three meters for easy tuning. Safety interlock switches on top and rear doors of the 28" high cabinet. Model 800, 150 Volts, 10 Amps, $345.

WEBSTER WIRE RECORDERS
You can make up to a full hour recording, without interruption, on a small spool of wire and play it back immediately, with surprising good reproduction. You can re-played indefinitely, or wire can be re-used. Excellent for recording DX QSO's, speeches, conferences, dictation, sound movies, language of speech correction study, plays, broadcast programs, etc.

Model 80 is a completely self contained compact, portable unit in a rugged, attractive carrying case. Records, rewinds, and plays back with simple control. Has good quality microphone, recording level indicator, amplifier, loudspeaker, provision for external input and output, and comes complete with one 15 minute and one 15 minute spools. Retail Price $149.50

$129.50

Harvey—Wells NEW
50 WATT TRANSMITTER
Band-switching 2 to 80, phone/CW. crystal controlled, wide band multipliers. Amazingly compact, PB for car, boat, or shack. Model TB-50. With tubes, less power supply. $99.50

Harrison has Transformers!

Altec, Kenyon, Stark, Thordarson

For a
 Beam Motor, etc., 115 Volt, 60 cycle primary. Delivers: 6.4 Volts at 3 Amps, 6.4 V — 10 A, 7.2 V — 2 A, 10 V — 5 A, 26.2 V — 6 A.

New, $4.50.

Harr利用 has TELEVISION KITS!
7-10-12 inch — all the best makes — at the lowest prices. Drop in — or mail your order.

Harvey-Wells NEW

Altec, Kenyon, Stark, Thordarson

For a

HARRISON RADIO CORPORATION
12 WEST BROADWAY • NEW YORK CITY 7
PHONE—Barclay 7-9854 • EXPORT DEPT.—CABLE—"HARRISRAD"

[HAM HEADQUARTERS FOR YEARS]

Harr利用 has Transformers!

Altec, Kenyon, Stark, Thordarson

For a

UTC Most complete stock in the world.
CONCERNING THE BASIC FOUR

Fifteen years ago, we were in the pie-pan and breadboard era. Then most of us kept an apprehensive eye on the color of the plate, perhaps using a mirror to see behind the panel... from time to time we "got fried" on the + in a hot key.

Today ham radio has come a long way. The modern amateur transmitter is indistinguishable from the finest commercial installation. For safety, convenience, and efficiency, it contains at least the basic four transmitter relays: time delay, overload, keying and antenna change-over... often several others.

For the convenience of hams planning to modernize, we have prepared a comprehensive catalog giving complete technical information on all Advance relays. There is an Advance relay for every ham need. Ask your jobber or write today for this valuable catalog.

WANT DISTANCE?

Use a KYTOON* and your antenna will really be up in the air! Read details of Field Day use in QST, page 24 of the October, 1946 issue. For further information write:

* T.M. REG. U.S. PAT. OFF.

DEWEY AND ALMY CHEMICAL CO.
Department X 89K
CAMBRIDGE 40, MASS.


Practical television is explained, covering the theory, mechanics, repair and servicing of television equipment.


This book covers the construction and operation of f.m. transmitters and receivers and all the apparatus used in them, and explains the practical use of this knowledge in operation, installation and servicing of present-day f.m. equipment.

WWV Schedules

STANDARD-FREQUENCY transmissions are made available as a public service by the National Bureau of Standards over its standard-frequency station, WWV, on the following expanded schedules and frequencies:

<table>
<thead>
<tr>
<th>Mc.</th>
<th>BST</th>
<th>Power Output</th>
<th>Audio Frequ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>7:00 P.M.-9:00 A.M.</td>
<td>1.0</td>
<td>440</td>
</tr>
<tr>
<td>5.0</td>
<td>7:00 P.M.-7:00 A.M.</td>
<td>10.0</td>
<td>440</td>
</tr>
<tr>
<td>5.0</td>
<td>7:00 A.M.-7:00 P.M.</td>
<td>10.0</td>
<td>400 and 4000</td>
</tr>
<tr>
<td>10.0</td>
<td>continuously</td>
<td>10.0</td>
<td>440 and 4000</td>
</tr>
<tr>
<td>15.0</td>
<td>continuously</td>
<td>0.1</td>
<td>440 and 4000</td>
</tr>
<tr>
<td>20.0</td>
<td>continuously</td>
<td>0.1</td>
<td>440 and 4000</td>
</tr>
<tr>
<td>25.0</td>
<td>continuously</td>
<td>0.1</td>
<td>440 and 4000</td>
</tr>
<tr>
<td>30.0</td>
<td>continuously</td>
<td>0.1</td>
<td>440</td>
</tr>
<tr>
<td>35.0</td>
<td>continuously</td>
<td>0.1</td>
<td>440</td>
</tr>
<tr>
<td>40.0</td>
<td>continuously</td>
<td>0.1</td>
<td>440</td>
</tr>
</tbody>
</table>

A 0.005-second pulse may be heard as a faint tick every second, except the 59th second of each minute. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted precisely on the hour and each five minutes thereafter, resuming after an interval of precisely one minute. This one-minute interval is provided to give Eastern Standard Time in telegraphic code and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. Ionospheric-disturbance warnings applicable to the North Atlantic path are given at 20 and 50 minutes past each hour. If a disturbance is in progress or is anticipated within 24 hours, the time announcement is followed by 6 Ws; if conditions are quiet or normal, the time announcement is followed by 8 Ns. The announcement of the station's services and of the station's call (WWV) is given by voice at the hour and half hour.

The accuracy of all the frequencies, radio and audio, as transmitted, is now better than a part in 50,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000001 second. The beginnings of the periods when the audio frequencies are off are synchronized with the basic time service of the U. S. Naval Observatory.
### Good Reasons Why

<table>
<thead>
<tr>
<th><strong>WORLD’S LARGEST STOCKS</strong></th>
<th><strong>EASIEST TERMS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>First with Everything in Ham Radio. Widest selections of all nationally famous station equipment. You name it—we’ll ship it.</td>
<td>Radio’s most liberal plan—full refund of carrying charges if you pay in 60 days, half-refund if you pay in half the contracted time. Write for the details.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>LOWEST PRICES</strong></th>
<th><strong>FAVORABLE TRADE-INS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>You buy at ALLIED at the lowest market price. You get highest quality at substantial savings on every order.</td>
<td>You’ll do better with our liberal allowances. Just drop us a line and we’ll work with you on fair and square trades.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>QUICKEST SERVICE</strong></th>
<th><strong>15-DAY TRIAL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Backed by giant stocks, our experienced staff lets no grass grow under its feet—speeds your orders to you.</td>
<td>You’re protected by our full 15-day trial period on receivers. If you’re not satisfied, with the equipment, return it for full refund.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ALL THE HELP YOU WANT</strong></th>
<th><strong>90-DAY GUARANTEE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Get personal help from our Ham Staff. We’re ready to tackle your problems, glad to help on any inquiry you shoot to us.</td>
<td>Everything we sell is covered by the full 90-day Radio Manufacturers Association warranty. You play safe when you buy at ALLIED.</td>
</tr>
</tbody>
</table>
JK STABILIZED IF-17W

The IF-17W is one of three new filter crystals, hermetically sealed, which permit operation from the Arctic to the Tropics. They are silver plated and wire mounted for higher Q, easier starting and elimination of sudden shift of peak frequency characteristics of the old air-gap type. Cut for low series resistance, low shunt capacity approx. 1.8 mmfd, low series resistance approx. 4,000 ohms. Dimensional responses are none = 10 ke. Type IF-17 has dimensions 1/16” dia., spaced 1/4” centers, type IF-17H has dimensions 1/8” dia., spaced 1/4” centers and type IF-17W has the 11/64” standard wire lead pilots.

The JAMES KNIGHTS CO.
SANDWICH, ILLINOIS

CUT HOLES FAST
IN RADIO CHASSIS

WITH A GREENLEE RADIO CHASSIS PUNCH

Single-Sideband 'Phone
(Continued from page 15)

no heterodynes between carriers, there is no heterodyne interference, the big bugaboo of 'phone as practised today. This fact, coupled with the obvious one that your signal occupies only half the spectrum space it does with conventional a.m., will make room for many more 'phone signals in the same number of kilocycles. With selective receivers that pass only one sideband, the number of clear channels is exactly doubled, but there is still another advantage. Suppose the interfering station is only 500 cycles removed; i.e., the two carriers, if they were transmitted, would be separated by that amount. And suppose that the same relative sideband (upper and lower) had been suppressed in each case. The unwanted signal would ride through the receiver along with the desired one, but it would be completely unintelligible. It would only manifest itself as monkey chatter in the background, there would be no interfering heterodyne, and one signal could probably be copied through the other. You know what two equal-strength signals 500 cycles apart can do with conventional a.m. — now you can see why we’re so enthusiastic about the possibilities of s.s.s.c.

With only a single sideband transmitted, you can expect less trouble with selective fading, the kind caused by the sidebands coming in with the wrong relative phase to each other and the carrier. We promised to mention receiver stability. You will recall that the carrier has to be reinserted with an error of less than about 20 cycles for full naturalness, but the requirement is only about 50 cycles for intelligibility. For many years this seemed like an insurmountable obstacle in the way of amateur s.s.s.c., but it is no longer so. Our present receivers, after they are warmed up, are capable of such stability over the period of a transmission, as has been demonstrated by the satisfactory reception of W6YX and W0TQK by many stations. By using crystal-controlled high-frequency oscillators, we should have no trouble with s.s.s.c., even on 29 Mc. This improved stability of receivers has been sneaking up on us over the years, and it only took the transmissions of W6YX and W0TQK to show that amateur s.s.s.c. is here and practical!!

Single-Sideband Tests
(Continued from page 18)

in the conventional W6YX transmitter is perhaps a little higher than in normal rigs because of the overmodulation splatter-suppressor circuit employed, which permits overmodulation during occasional peaks.1) Since October 9th, we have worked the following

(Continued on page 128)

NEWARK'S SMASHING SURPLUS VALUES!

**TERRIFIC PRICE REDUCTIONS ON TUBES**

ALL NEW — GUARANTEED

Smashing Reductions of 50% and more on same types. **BUY NOW!**

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>NY68</td>
<td>$1.65</td>
<td>807</td>
</tr>
<tr>
<td>HY69</td>
<td>$1.15</td>
<td>809</td>
</tr>
<tr>
<td>TZ40</td>
<td>$2.49</td>
<td>610</td>
</tr>
<tr>
<td>2AP1</td>
<td>$2.35</td>
<td>813/V42</td>
</tr>
<tr>
<td>2AP1A</td>
<td>$2.55</td>
<td>813/V744</td>
</tr>
<tr>
<td>2AP2</td>
<td>$1.31</td>
<td>820</td>
</tr>
<tr>
<td>2A8</td>
<td>$1.01</td>
<td>832A/322</td>
</tr>
<tr>
<td>2CL2/279</td>
<td>$2.20</td>
<td>857</td>
</tr>
<tr>
<td>3AP1</td>
<td>$1.59</td>
<td>865</td>
</tr>
<tr>
<td>3AP2</td>
<td>$1.95</td>
<td>867</td>
</tr>
<tr>
<td>3BP1</td>
<td>$1.20</td>
<td>8222/872</td>
</tr>
<tr>
<td>3BP2</td>
<td>$1.25</td>
<td>8224/874</td>
</tr>
<tr>
<td>3BP4</td>
<td>$1.73</td>
<td>8226/876</td>
</tr>
<tr>
<td>3BP1A</td>
<td>$6.00</td>
<td>8228/878</td>
</tr>
<tr>
<td>3DL4</td>
<td>$1.25</td>
<td>8230/8710</td>
</tr>
<tr>
<td>3NL5</td>
<td>$0.81</td>
<td>8232/8712</td>
</tr>
<tr>
<td>3NK5</td>
<td>$1.00</td>
<td>8234/8714</td>
</tr>
<tr>
<td>4CG6</td>
<td>$0.95</td>
<td>8236/8716</td>
</tr>
<tr>
<td>4CG4</td>
<td>$1.75</td>
<td>8238/8720</td>
</tr>
<tr>
<td>6CG6</td>
<td>$0.95</td>
<td>8240/8722</td>
</tr>
<tr>
<td>6CL6</td>
<td>$0.75</td>
<td>8242/8724</td>
</tr>
<tr>
<td>6CW6</td>
<td>$0.65</td>
<td>8244/8726</td>
</tr>
<tr>
<td>6CP6</td>
<td>$1.10</td>
<td>8246/8728</td>
</tr>
<tr>
<td>6CP8</td>
<td>$1.10</td>
<td>8248/8730</td>
</tr>
<tr>
<td>6CP1</td>
<td>$1.25</td>
<td>8250/8732</td>
</tr>
<tr>
<td>6CP2</td>
<td>$1.25</td>
<td>8252/8734</td>
</tr>
<tr>
<td>6CP4</td>
<td>$1.20</td>
<td>8254/8736</td>
</tr>
<tr>
<td>6CP1A</td>
<td>$6.00</td>
<td>8256/8738</td>
</tr>
<tr>
<td>6CL1</td>
<td>$1.00</td>
<td>8258/8740</td>
</tr>
<tr>
<td>6NL4</td>
<td>$1.25</td>
<td>8260/8742</td>
</tr>
<tr>
<td>6NB5</td>
<td>$0.95</td>
<td>8262/8744</td>
</tr>
<tr>
<td>6NK5</td>
<td>$1.00</td>
<td>8264/8746</td>
</tr>
<tr>
<td>6CG1</td>
<td>$0.95</td>
<td>8266/8748</td>
</tr>
<tr>
<td>6DS1</td>
<td>$0.95</td>
<td>8268/8750</td>
</tr>
<tr>
<td>6DS2</td>
<td>$0.95</td>
<td>8270/8752</td>
</tr>
<tr>
<td>6DS3</td>
<td>$0.95</td>
<td>8272/8754</td>
</tr>
<tr>
<td>6DS4</td>
<td>$0.95</td>
<td>8274/8756</td>
</tr>
<tr>
<td>6DS5</td>
<td>$0.95</td>
<td>8276/8758</td>
</tr>
<tr>
<td>6DS6</td>
<td>$0.95</td>
<td>8278/8760</td>
</tr>
<tr>
<td>6DS7</td>
<td>$0.95</td>
<td>8280/8762</td>
</tr>
<tr>
<td>6DS8</td>
<td>$0.95</td>
<td>8282/8764</td>
</tr>
<tr>
<td>6DS9</td>
<td>$0.95</td>
<td>8284/8766</td>
</tr>
<tr>
<td>6DS10</td>
<td>$0.95</td>
<td>8286/8768</td>
</tr>
<tr>
<td>6DS11</td>
<td>$0.95</td>
<td>8288/8770</td>
</tr>
</tbody>
</table>

**CW-3 110V Superhet RECEIVER**

$10.95

The CW-3 Superhet Receiver in its original form is a 7-tube fixed-tuned aircraft frequency unit. The circuit comprises SF, Mixer-Oscillator, IF 2nd Available new, BRAND NEW, but less coils and crystal, unit offers many features and will supply a fixed-tuned channel for "WWV" providing a stand-by feature with its many uses. Use it for IF and Output Channel in and 6SN7 tubes. Many fine quality components to salvage, if desired. 3½ x 32 lbs. with tubes, less coils and crystal. A Smashing Buy!

**FAMOUS BC-221 CRISTAL CALIBRATED FREQUENCY METER**

$36.95

Use it as a Signal Generator and VFO. Crystal calibration in all ranges — 125-250 and 200-400 Kc. Not brand new, but in excellent condition — ready to operate. Complete with Tubes, Crystal and Original Calibration Book. Use it with 110VAC power pack, batteries, or vibrapack. A wonderful unit at a New Low Price..............

**SCR-522 TRANSCEIVER**

$14.95

A Terrific Buy! The finest 2-meter surplus rig available on an amazing price Receiver — Xmitter, less power supply and control box. Most have crystals and tubes, some are missing. But basic unit is there — ready to operate and enjoy. Schematic included. Wgt. 75 lbs. They’re going fast! "AS IS", Only............

Include Postage

ELECTRIC COMPANY, INC.
323 W. Madison St.
Chicago 6, Ill.
NOW...For The First Time!
A Rotary-Beam TOWER
At A Price You Can Afford!
Attractive — Self-Supporting
NO GUY WIRES
- Galvanized Steel—Will Last A Lifetime!
- SAFE—Ladder to Top
- COMPLETE—Ready to Assemble
- Easy to Assemble & Erect
- Withstands Heaviest Winds

LOOK AT THESE LOW PRICES!
Three popular sizes. Assembled on the ground with a wrench in a few hours. No footings required. Made by one of the oldest manufacturers of steel towers.

- 33 ft.—$99.75  
- 39 ft.—$107.25  
- 61 ft.—$199.75

Shipped FOB Kansas City, Mo., 4th class freight. Prices subject to change. Send check or money order or write today for complete FREE information!

Vesto "Tilt-Top" MOUNTING HEAD
Makes it possible to swing boom to a vertical position where elements may be easily adjusted.
- Easy to attach to any type pole or tower
- Any Rotary Head will fit it
- Made of heavy cast aluminum, 16" x 16", hinged with adjustable stop chain. Heavy steel hinge rod.

Shipping Weight 22 lbs. Price $24.50 fob Parkville, Mo.

VESTO CO., PARKVILLE, MO.

---

DX on s.s.s.c. (no special effort made at DX work):
October 9th — VK4KS Fragmentary contact. VK4KS in contest.

October 25th — K16MQ/J9 Kwajalein, Marshall Islands. Got us distinctly through bad QRN.

ZS6GF Pretoria, South Africa. Had 40-minute solid QSO. Reported s.s.s.c. easily readable but hard to tune. Had AR-88 receiver.

On November 3, 1947, worked W6TQK at 8:55 p.m. PST, for the first two-way single-sideband QSO. Our first contact with W6TQK was on October 21st, and he had built up his entire rig in the meantime! On November 8th, worked W6TQK for first duplex s.s.s.c. QSO; very nearly solid circuit for one-and-one-half hours.

Thanks are due the following members of the Stanford Radio Club for their assistance in connection with the single-sideband tests: Dave Thompson, W6VQB, Rob Beaudette, W7FXI, and Chet Carr, W6NVH.

---

Single-Sideband Transmitter

(Continued from page 4)

In all cases where the receiving station has been able to tune in the s.s.s.c. signal correctly, the results have been very gratifying. The most apparent effect is the terrific reduction in QRM compared to double-sideband transmission.

When one tunes in a single-sideband signal, it sounds like — and is! — a sideband that has lost its carrier. No amount of tuning will restore its readability. The essential thing to remember is that this very narrow band of frequencies being transmitted must be centered in the passband of the receiver if amplifier. This is most easily done by using sharp i.f. selectivity, crystal in first or second position, and tuning for maximum signal.

Once centered in the i.f. channel, the receiver is set up for c.w. reception, audio gain on full and r.f. gain reduced, and the b.f.o. set to the frequency of the missing carrier. In order to set the b.f.o. a very careful adjustment is required, since the exact frequency may be passed over during periods of no modulation. If the oscillator is set on the wrong side, the speech will appear inverted and unreadable. As most receivers will drift during stand-by, the high-frequency oscillator (main tuning) should be corrected since most of the drift is in this oscillator. Changing the b.f.o. will set the signal out of the i.f. passband. If sufficient selectivity is available in the i.f. amplifier, it can easily be seen that two stations can use the same carrier frequency with no interference. A recent test with a dual-conversion amateur receiver showed that no retuning was necessary over a period of more than half an hour. S.s.s.c. communication places a severe stability requirement
ATTENTION ! ! ! !

ALL SCR-522 OWNERS:

Remote Control Boxes for SCR 322's, Brand New! In Original Packing; Consists of 5 push button switches, 3 Western Electric Pilot Assemblies, with Pilot Bulbs and Dimmer, and Lever Switch all finished in Black Friction. Order yours To-Day for only...$1.25 ea.

Antenna Plug 46-PS-1 for 522A
15¢ ea.

832A Tubes, brand new...$2.15
De Jur Amco wire wound Potentiometer, 12 watt, 20,000 Ohm. Special...49¢
6-Volt Bayonet Base Pilot Assemblies with Dimmer, red or white...19¢
ARC-5 Banana Plugs, silver plated. Per dozen...10¢
Oncor Transformers, Mike-to-Grid, 25:1 ratio, low to high impedance 35¢ ea. 10 for...$3.95

WIRE WOUND POTENTIOMETER

100,000 ohm, precision made. G.R. type, 25 watt, 6" diameter. Brand new...$1.95

Shure Phono Pickups, 1/8 oz. Low Pressure, brand new, for...$1.95

G.E. Relay, 200 Amps. Silver Plated Contacts, 24 Volt Coil...$2.45
Sigma Relay, Hermetically Sealed, Plug In Type; Fits 5-Prong Socket, 4 Ma. D.C., 2000 Ohm Coil...95¢
Crystal Diodes 1N23A; Swell for Field Strength Meter or Crystal Set. 35¢ ea. 3 for...$1.00
1-Inch Bull's Eye Pilot Assemblies, Candelabra Base; Red or Amber...49¢
Heinemann Magnetic Type Circuit Breakers, 3-5-25-35 Amp Sizes...$95¢
39-Inch Telescoping Antennas...25¢

Shure Crystal Bulllet Microphone, with Stand and 7 feet of Cable. Regular $16.50 List. For...$5.50

I.T. and T. SELENIUM RECTIFIERS

Full Wave Bridge Rectifiers; 54 volts AC Input, 39 volts DC Output at 1.2 Amps. Signal Corps. Spec. 4DO238. Special at...$1.50
Full Wave Bridge Rectifier; 144 volts AC Input, 96 volts DC Output at 1.1 Amps. Signal Corps. Spec. 9DO612B. Special at...$2.50

These Units Are All Brand New

Best Buy Of The Month

25-foot length of 24 conductor rubber covered cable. Each conductor No. 20 Stranded and Color coded; cable has H.B. Jones S-324CCT 24 point socket at each end. Shipping Weight 6 lbs. Only...75¢

Radio Transmitter & Receiver Aps 13

Tunes 410/420 megacycles, light weight airborne Radar. 17 tubes, including 5/6L6; 9/6AG5: 2/2D2; 1/VR103 and 30 megacycle I.F. strip. All for...$11.95

OIL FILLED CONDENSERS

0.1 Mfd., 7500VDC, G.E...............$1.50
3XO.2 Mfd., 4000VDC. Tobe...$1.95
10 Mfd., 600VDC, G.E...............$1.95
10 Mfd., 1500VDC. C.D...............$3.50
16 Mfd., 400VDC, W.B...............$95¢
7 Mfd., 330VAC, G.E...............$1.25
2 Mfd., 1000VDC, Aero............$1.75
1 Mfd., 3000VDC. Solar............$2.95

Variable and Mica Condensers

APC-25 Trimmers, screw driver adjusted, 12 plates. 25 Mfd silver plated variables. 15¢ ea. 10 for...$1.25
30 Mfd 600VDC Postage Stamp Type Micas. 5¢ ea. 100 for...$4.75
15 Assorted Silver Mica Condensers. A Real Buy at...$2.50
100 Mfd. Double Bearing Variables, polished plated, isolantite insulation, can be ganged at either end. 25¢ ea. 10 for...$2.50
25 Mfd. Balanced Stator Variables, polished plated, isolantite insulation, Swell for V.H.F. 25¢ ea. 10 for...$2.50
0.4 Mfd. Aerovox Mica Condensors, 600 VDC E.I. In low loss Balasite case. A real buy at...$2.50

5-INCH CATHODE RAY TUBES, Type 5BP1. Green Screen, Brand New and in Original Cartons. All Scope owners will want a few of this ridicu­ously new low price of...$1.95 EACH

General Radio Variacs

For Voltage and Power Control
200-B—170KVA, 0-135V. Output I Amp...$12.50
V-5—860KVA, 0-135V, Output 5 Amp...$18.50
For Panel Mounting
V-5MT—860KVA, 0-135V, Output 5 Amp. $25.00
For Table Mounting
V-10—1.725KVA, 0-135V, Output 10 Amp. $33.00
V-10MT—1.725KVA, 0-135V, Output 10 Amp. For Table Mounting $40.00

These Variacs are all Brand New, in Original Boxes and are the Latest Models and Design.

Note: If not rated 25% with order, balance C.O.D. All prices F.O.B. our warehouse New York. No order under $2.00. We ship to any part of the globe.

LEEDS RADIO CO.
75 Vesey Street
Dept. QS1
New York City 7
A. iroorl volt-ofun-milli­
ammetcr is usually the
first

instrument pur­
chased hv any radio
man. Chi~airo j?,..ather­
wightl:l ,,ffei· so great a
value iu accurate quality,
i;.mall size, in a wi,lc Rdcction
of ranges and sensitivities. that
they are the first choice of amateurs everywhere.

Chicago volt-ohm-milliammeters arc priced from
$5.15 to $26.00 depending on sensitivity, ranges,
etc. At our modest prices, no ham shack need be
without the benefit of this most useful instrument.

Chicago volt-ohm-milliammeters are priced from
$5.25 to $26.00 depending on sensitivity, ranges,
etc. At our modest prices, no ham shack need be
without the benefit of this most useful instrument.

in the receiver, but the present trend appears to
be toward this end.

In spite of its apparent complexity of construc­
tion, only five evenings were consumed in building
this equipment. The saving in large modulator
and r.f. driver tubes and their power supplies
more than overcomes the few additional receiving
components needed, and it is hoped that adequate
filters will soon be offered for less than the cost of
a modulation transformer. This is the first stab
at reducing QRM on the amateur 'phone bands
since the modulated oscillator was outlawed.
It's up to you!

Any DX Today?

(Continued from page 21)

If 50-Mc. WAC is to be achieved it will call for
consistent daily operation by all concerned, with
good antennas and receivers, using the methods
of m.u.f. observation outlined above.

In carrying out observations such as described
in the foregoing many interesting problems need­
ing explanation, with plenty of food for thought
for those with inquiring minds, present them­
selves. What, for instance, causes an ionos­phere
storm and its associated auroral effects? Why are
there no ionosphere storms in mid-December,
when the North Pole is In darkness (possibly be­
cause this is an ultraviolet-light effect)? Why
does the $2 m.u.f. drop so much in midsummer
giving a general effect very similar to ionos­phere­
storm days in October-November or February­
March? What causes the very high $2 m.u.f. of
winter days at sunspot maximum — is it purely
ultraviolet radiation, the angle at which it strikes
the upper atmosphere being of importance, or is
some other factor involved? What causes spor­
radio-E ionisation in both this and the other re­
gions? How important and interdependent are
actual weather variations in the stratosphere
and above? ... And so on!

There is now a great deal of evidence — it re­
mains to be analyzed and interpreted!

Conclusion

The examples of various records accompanying
this article represent only a few of those made at
G6DII over a number of years. Further details of
these are available for anyone who has a genuine
use for same.

25 Years Ago

(Continued from page 30)

9AUS, 9DTM and 9ZAF rendering splendid pub­
lic service. ... At the Seattle Radio Show the
public was given a demonstration of the "Radio
Hound" radio-controlled car built by 15-year-old
Kenneth G. Field, 7QB .... For a second year
the Department of Commerce gives recognition
and encouragement to amateurs, with the an­
nouncement of a Hoover Cup for 1922.

Gracing the pages of the "Who's Who in Ama­
(Continued on page 138)
A FEW OF THE ITEMS
WE STOCK ARE LISTED BELOW

Collins 75A-1 ........................................... $375.00
Hallicrafters S38 ......................................  47.50
Hallicrafters S40A ....................................  89.50
Hallicrafters SX43 .................................... 169.50
Hallicrafters SX42 .................................... 275.00
Hallicrafters SP44 ....................................  49.50
Hallicrafters HT18 ................................... 110.00
Hallicrafters HT9 ..................................... 350.00
National NC57 ........................................  89.50
National NC173 ...................................... 179.50
National NC185 ...................................... 269.00
National NC240D .................................... 225.00
National HRO-7 ..................................... 279.00
Hammarlund HQ129X ................................. 177.50
Hammarlund SPC400X ................................ 398.25
Hammarlund Four-20 ................................ 120.00
Hammarlund Four-11 ................................  72.50
RME 84 ..................................................  98.70
RME 45 .................................................. 198.70
RME VHF152A ........................................  86.60
RME HF-10-20 .......................................  77.00
RME DB22A ...........................................  66.00
Collins 32V1 ..........................................  475.00
Meck T60 .............................................. 150.00
Signal Shifter model EX. .........................  99.50
Bud VFO-21 ..........................................  52.50
Millen 90800 exciter ..............................  42.50
Millen 90700 VFO ...................................  42.50
Millen 90281 ..........................................  84.50
Millen 90881 ..........................................  89.50
Millen 90810 ..........................................  69.75

McMurdo Silver, Sonar, Gordon, Premax, Workshop, Gonset; we have everything.

Prices slightly higher on the West Coast.

Orders and inquiries from outside U.S.A. welcome.
New Low Prices on

CLARK CRYSTALS!

Effective January 1, 1948

<table>
<thead>
<tr>
<th>Type and Description</th>
<th>Pin Spacing</th>
<th>Frequency Range</th>
<th>Net Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM-2A fundamental</td>
<td>500'</td>
<td>160' (XFM) 80</td>
<td>=5kc 32.25</td>
</tr>
<tr>
<td></td>
<td>or 40</td>
<td>meters =0.03%</td>
<td>2.65</td>
</tr>
<tr>
<td>PM-2H harmonic</td>
<td>500'</td>
<td>20 meters</td>
<td>=10kc 2.90</td>
</tr>
<tr>
<td>PM-2C fundamental</td>
<td>500'</td>
<td>1 cm to 10 cm</td>
<td>=5kc 4.75</td>
</tr>
<tr>
<td></td>
<td>(outside ham)</td>
<td>=0.01%</td>
<td>5.90</td>
</tr>
<tr>
<td>Special Price—Jan. 48</td>
<td>only</td>
<td>1 cm, 5 cm,</td>
<td>=0.005% 2.95</td>
</tr>
<tr>
<td></td>
<td>or 10</td>
<td>meters</td>
<td></td>
</tr>
<tr>
<td>LF-2A dual freq.</td>
<td>750'</td>
<td>100 &amp; 1000 kc (exact)</td>
<td>0.75</td>
</tr>
<tr>
<td>LF-3A Frequency standard</td>
<td>750'</td>
<td>100 kc (exact)</td>
<td>6.95</td>
</tr>
<tr>
<td>HSM-2A harmonic</td>
<td>500'</td>
<td>10 meters</td>
<td>=25kc 4.50</td>
</tr>
<tr>
<td>Hermetically sealed</td>
<td>500'</td>
<td>6 meter doubler</td>
<td>=5kc 4.50</td>
</tr>
<tr>
<td></td>
<td>=25 kc</td>
<td>or 2 meter mul-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tipler</td>
<td>or</td>
<td></td>
</tr>
<tr>
<td>15 day delivery *</td>
<td>Fully guaranteed * Postpaid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CLARK CRYSTAL COMPANY
Marlboro, Massachusetts, U.S.A.
Successor to Precision Crystal Div. of Harvey-Wells Electronics, Inc.

PRE-EXAM TESTS
For Commercial Radio Operator FCC LICENSE EXAMINATIONS

Don't Take A Chance!
Avoid Failure on FCC Commercial Radio Operator License Examinations!

USE NELSON'S COMPLETE PRE-EXAMINATION TESTS AND COACHING SERVICE
Enables You To
Rehearse the FCC license examinations
Practice the procedure

Check your knowledge
Locate your weak points before taking the actual examination
Prepared by Arthur B. Nelson, Famous Co-author of Nelson and Harvey's RADIO OPERATING QUESTIONS AND ANSWERS

Use Coupon or write for Descriptive Folder No obligation—no salesman
CLEVELAND INSTITUTE of RADIO ELECTRONICS

QT-1 Terminal Tower
Cleveland 13, Ohio

MAIL THIS COUPON

Cleveland Institute of Radio Electronics
QT-1 Terminal Tower, Cleveland 13, Ohio

Dear Gentleman: Please send information about Pre-Exam Tests. Does not cover Amateur License Exams.

Name ..................................................
Address .............................................
City ..................................................
Zone ..............................................
State ..............................................

Happenings
(Continued from page 44)

channel interference, particularly in the matter of harmonics. The way things are set up now these services are insurmountably going to be in each other’s hair and, as we appraise it, the situation is going to be almost intolerable for all of us. In the light of the practical experience we gained it could well be that a general realization of the entire range under 88 Mc, would permit a more comfortable arrangement of the four services in their mutual relationships.

The position of amateur radio in the present allocation is an intensely difficult one and, because of the great importance to us of our allocations in this vicinity, a matter of serious concern to us. Amateur stations of course are nearer altogether in residential areas, at short distances from television receivers. We have a band from 28 to 29.7 Mc. (a range which has never been assigned to any other service) the second harmonics of which fall in a television band. Because the operations of lorans have denied us the return of our band 1750-2050 kc., the 28-Mc. band is the only amateur allocation below 50 Mc. which is open to telephony by Class B and Class C amateurs, in consequence of which it carries a heavier load of activity than any other amateur band. As we shall show, it is impossible to suppress this interference to television reception, at the distances involved. We have another band from 30 to 54 Mc. which has a television channel on each side of it, yet the allocation established by the Commission in 1945, in its placement of television channels in their mutual relationships. In recent weeks, by virtue of current ionospheric conditions, many amateurs have engaged in trans-Atlantic and trans-Pacific two-way communication on this band, and scores of amateurs have made transcontinen
tal contacts. The amateur distance record on this band has been successively broken until now it stands at 10,500 miles. Careful records are kept and correlated with ionospheric predictions, in liaison with the Central Radio Propagation Laboratory. Similar work of scientific value is being done in connection with sporadic-E and extended-tropospheric transmission. In short, the two amateur bands in question are of great importance in the structure of amateur radio, yet the allocation established by the Commission in 1945, in its placement of television channels in their relationship to our amateur bands, is one which simply invites serious interference to the former service, precipitating a condition which, with the growth of interest in television, is practically certain to result in a public demand for restraint on our activities, through no fault of our own. Amateur radio is an old and honorable service, with a proved record of national usefulness, and we express strong objection to television allocations made in such a manner that it is impossible
BC-1023-A, designed for reception of modulated signals 62-80 MC. Ultra-sensitive plate-current relay in set can be adopted to control external circuits, open doors, etc. Complete with oil tubes: 6SQ7, 6SC7, 6U6GT, 12SH7, operates directly from any 12-14 VDC power supply. Handsome aluminum cabinet with shock mounting base. BRAND NEW, in original carton $2.95.

SIMPSON 2¼" METER 0-300 MA, DC, ring mounting. Brand new, boxed... $2.50

PL-SS PLUG AND CORD Standard plug with 6 ft. rubber, 2-wire cord... 30c

CONTROL BOX Aluminum box contains 2 jacks, 150 M ohm control and 4-position switch, brand new... 20c

MARKER Control all of your equipment with this one relay. 110 VAC coil, 4-pole, 2 double throw, 2 single throw. 13 Amp, contacts, screw terminals, insulated base, 3" x 3 1/2", a terrific bargain at... $2.00

U. S. ARMY HEADSET HS-30-R Lightweight, complete, with extra pair rubber ear inserts, clip to take weight off ears, and adjustment instructions. Standard low impedance (500 ohms) matching Transformer Hi-Z to 500 ohms... 39c

GRID BIAS CONTROL 2500 ohm, 25 watt Clarostat potentiometer, perfect grid bias control for average final, worth $4.95, brand new, boxed... 40c

DON'T MISS THESE SCOOPS!

Cone stand-off, base 1", height 1 1/2", with hardware... 9c
National R-300-U RF choke, 2.5 MH, 300 MA... 10c
Ceramic coil form 1 1/2", 4-prong, grooved, drilled... 10c
Ceramic wafer switch, 2-pole, 2 position... 20c
APC type condensers, with shafts, 25, 35, 50 mmf... 20c
Sprague 2 Mfd, 1000 volt oil-filled condenser... 70c
G-E Pyraline miniature 1 Mfd, 500 V, mfg. ft. 20c
Johnson 224, 4 prong, Steatite socket... 15c
Johnson 225, 5 prong Steatite socket... 17c
Johnson 211-165, 50 watt, 4 prong, ultra-Steatite, Beryllium Copper THE FINEST... 60c
Johnson 70120, 70 mmf, 2000 V, spacing, perfect for 807... 1.19
50,000 ohm, 200 watt bleeder, ferrule type... 59c

PAN ADAPTOR Originally $99.75. Brand New... 47.50

STEINBERG SUPER SPECIALS Every Item Is Brand New

THORDARSON MULTI-FILAMENT TRANSFORMER 2.5 Volt 10 Amp, 6.3 Volt 5.5 Amp, 6.3 Volt 1 Amp. 5000 Volt insulation, hermetically sealed, ceramic feed thru connections, 110 Volt, 60 cycle primary. 4 1/2" x 3 1/2" x 5 1/2"... $2.95

3-GANG VARIABLE CONDENSER 365 Mmf per section, ceramic insulation, ball-bearing shaft. Sturdy, rigid, front and rear shafts 1/8", can be ganged... 60c

ANTI-CAPACITY SWITCH One set of 3PDT contacts, two sets of SPST contacts normally closed. Center, up down action on rubber cushioned cam, positive hold in. Nickel plated metal bracket for plate mounting... 60c

MINIMUM ORDER $2.00. Send 20% deposit with COD orders. Please include sufficient postage or instruct us to ship by Express Collect. Overpayments will be refunded by check.

STEINBERG 633 WALNUT STREET, CINCINNATI 2, O.
SPECIAL OFFER
Factory Loaded DEKA-XTAL
$14.95
10 crystals our selection. See your dealer or write.

10 FREQUENCIES
WITH A
"Flick of the
Wrist"

Deka Holder
less crystals
Your choice of crystals in 40, 80 meter bands
40 meter band $1.35
20 meter band $2.00
Special frequencies available. Write for prices.

Plugged into your oscillator, the DEKA-XTAL gives you crystal control, signal shifting, rapped, compact, moisture and dirt-proof. Order the holder with as many crystals as you want, up to ten, and add other frequencies later.

SCIENTIFIC RADIO PRODUCTS COMPANY
738/2 W. Broadway Phone 3-1412
Council Bluffs, Iowa

GET YOUR
FCC COMMERCIAL Radio Operators' License

How To Pass FFC LICENSE EXAMINATIONS

IT'S EASY IF YOU FOLLOW OUR PLAN! Thousands of new licensed radio operators - FM, TELEVISION, MOBILE COMMUNICATION SYSTEMS are only a few of the new radio fields which require licensed operators.

FREE BOOKLET Tells you the Government Requirements for all classes of commercial licenses. Saves you many hours of random, un-directed study. Assures a minimum of time in getting your ticket.

Cleveland Institute of Radio Electronics
Q.T.-1, Terminal Tower, Cleveland 13, Ohio
Approved for Veteran Training under GI Bill of Rights

MAIL THIS COUPON

Cleveland Institute of Radio Electronics
Q.T.-1, Terminal Tower, Cleveland 13, Ohio
Gentlemen: Please send your FREE Booklet: "How to Pass FCC License Examinations." (NOTE: This booklet does not cover examinations for Amateur Licenses.)

Name
Address
City
State

Check here, if a veteran

for us to work without interference even when we observe the highest standards in the art. We submit that it is not reasonable to put us in this position. We submit that any allocation that does so is faulty engineering. We consider the present allocation in that category and assert that it is not proper to impose such an allocation upon us. We feel the need of assuring also that the rights of our service to exist in this frequency range are the equal of those of any other service, and that the Commission may be an allocation that is of no reasonable hope of avoiding destructive interference, despite the best engineering practice in the operation of transmitters, it will not be the fault of the amateur and he should not be expected to make any concession to such an allocation. In short, we must resist any implication that television broadcasting is more in the public interest than the activities of the amateur service and must assert our equal right to make every reasonable use of our allocations, provided that we comply with good engineering practice and the extensive body of technical regulations that govern amateur operation.

We are, on the other hand, intensely conscious of our relationship to the general public and deeply concerned about the inseparable predilection in which the present allocations place us. We feel, as we have said, that there are many other reasons besides our own case that indicate that a satisfactory television service cannot be operated in this part of the spectrum. Shortly of that, we believe, as we have also said, that a re-engineering of the allocations in that part of the spectrum could overcome many of the difficulties. Should the Commission fail, however, that it is bound to maintain the essentials of the present television channeling system in this spectrum range, then we are still of the opinion that the allocation made in the present basis allocation that would help both the amateur service and the other services concerned. These suggestions we should now like to outline and explain to you. The Notice of Proposed Rule Making contains the following statements:

“4(D) - Possibilities of interference to television from such sources as harmonic radiation, television receiver response to stations on intermediate or image frequencies and television receiver oscillator radiations are engineering equipment problems which the Commission expects can more properly be solved by equipment development rather than further revisions of frequency allocations.”

We agree with the general principle that frequency allocations should be independent of equipment deficiencies. It is nevertheless true that, for practical working, the existing technical state of the art has to be considered in making allocations. Transmitter frequency tolerances and receiver selectivity characteristics have always been determining factors. In addition, particularly, have not always had a profound influence on the assignment of channels for broadcasting.

In the past it has not been necessary to take into account harmonic radiation from transmitters, for the excellent reason that the degree of harmonic control possible and the nature of the services to which interference was caused were such that harmonic difficulties could be resolved readily. V.h.f. broadcasting changes this situation completely. Broadband assignments in the v.h.f. range not only are higher in frequency than the great majority of stations in the other services but the channels are so wide that harmonic interference is practically inseparable. The amateur service, with its greater number of stations than any other service, and with its transmitters frequently located a matter of yards or even feet from one or more broadcast receivers, is particularly likely to be the source of widespread interference to television reception unless this factor is taken into account in allocating.

At the informal engineering conference held by the Commission staff in June of this year, the League, through Robert M. Morris, presented data accumulated in an investigation of a number of cases of amateur interference to television. It was shown at that time that the principles of good engineering design as applied to amateur transmitters could be expected to give a fundamental-to-harmonic ratio of the order of 50 db. By carrying harmonic suppression methods to a degree that represented considerably more than ordinary engineering practice, the Commission's staff showed that it was possible to secure a ratio of the order of 70 db. To the best of our knowledge this figure has not been exceeded. More significant, however, than the attenuation ratio itself is the fact that the Commission's measurements

(Continued on page 138)
NOW READY!

The 25th edition of the Handbook is featured by the complete rewriting of the material to give a more understandable discussion of those basic facts that an amateur should know to get the most out of constructing and using his apparatus. Owners of previous editions will recognize immediately that the overall plan of the book has been changed — achieving, we believe, the object of segregating the material so that it can be most conveniently used. A great deal of new equipment has been constructed especially for this edition. As always, the object has been to show the best of current technique through equipment designs proved by thorough testing. As the art grows, the problem of presenting a representative selection of gear grows with it — a state of affairs that is reflected in an increase of well over a hundred pages in this edition. New chapters on ultrahigh frequencies, station assembly, and the elimination of interference to broadcasting have been added to round out the treatment of all phases of amateur radio. The material on operating has likewise been greatly expanded. Altogether, this revision is the most comprehensive of recent years.

Price $2.00

UNITED STATES, ITS POSSESSIONS AND CANADA

$2.50 Elsewhere

BUCKRAM BOUND $3.00

AMERICAN RADIO RELAY LEAGUE, WEST HARTFORD, CONN., U.S.A.
showed a harmonic field strength of the order of a few hundred microvolts per meter at a distance of 100 feet, close to the ground.

It was the consensus of the engineering meeting that a ratio of about 40 db. between the desired television signal and an in-channel interfering signal is necessary for acceptable reproduction of a television picture. If a figure of 500 microvolts per meter is accepted as the lower limit of the field strength for satisfactory television reception, an in-channel interfering signal cannot exceed 5 microvolts per meter at the same point without causing interference. At the present time, many television receivers are operating with considerably less than a 500-microvolt-per-meter signal, and the owners expect nevertheless to receive interference-free pictures. In the amateur case, where a 28-Mc. transmitter may be located a matter of yards from the television receiver, we estimate that a fundamental-to-harmonic ratio of 110 to 120 db. must be achieved if there is to be no interference. In the present state of the art, such attenuation is some 40 to 50 db. higher than is known to be possible of attainment.

We submit that, in a situation such as this, there is no visible means by which this problem can be solved by equipment development, and that it is proper for the Commission to give it full consideration in setting up frequency allocations.

The League always has advocated assignment of amateur bands in harmonic relationship. Until the 1945 allocations revision, this harmonic relationship was preserved through the modern amateur assignments below 300 Mc. The 1945 allocations substituted the band 50-54 Mc. for the present band of 50-60 Mc. as part of a compromise plan by which it was expected that an extra television channel could be carved out of a spectrum which otherwise did not have enough room for it. The Notice of Proposed Rule Making now under consideration is evidence that other features of that allocation have since proved impracticable. To avoid interference, it is now proposed to take one channel from television broadcasting and assign it to the fixed and mobile services. No consideration is given to reduction of harmonic interference. We believe that it has been amply demonstrated that harmonics cannot be suppressed to the point where there will be no interference, but that, instead, the second harmonic of a transmitter operating at a power level of a few hundred watts can be expected to cause general interference to television reception over a radius of 1/4 to 1/2 mile, when the second harmonic falls in a television channel. When the number of amateur transmitters and their close spatial relationship to the general public is considered, we believe that there is here a co-channel problem that may well exceed the magnitude of that existing between the television and the fixed and mobile services.

This point deserves further discussion. Taking the proposed allocations as given in Appendix G of the Notice of Proposed Rule Making, we estimate that the total population in areas that will be served by Channel 2 is approximately 38,000,000, or about 30 per cent of the total population of the country as shown by the 1940 census. Thus, the total of the population within an approximate 30-mile radius of each of the cities in which Channel 2 is intended to be assigned. On the reasonable assumption that the density of amateur transmitters follows the population density, 50 per cent of all amateur transmitters will be located in those same areas. In other words, close to 25,000 amateur stations are potentially capable of causing interference to Channel 2 because of irrevocable second harmonics from the amateur band 28-29.7 Mc. The great majority of amateurs actually are equipped to work on this band, and surveys by our Communications Department show that 30 per cent of all amateur operating activity occurs there. This 28-Mc. band has become the scene of the local communication that formerly was concentrated in the band 1750 to 2050 kc., a band which has not been available to amateurs since the 1945 frequency allocations. We do not believe that the Commission intends to withdraw from amateurs the privilege of working in the present 28-Mc. band, yet as a practical matter that could be the effect of maintaining the harmonic relationship between that band and television broadcasting.

Now that the Commission is proposing the elimination of one television channel, the necessity for the compatibility that resulted in the dislocation of our present 56-60 Mc. band no longer exists, since that relocation was done simply to make the extra television channel possible. Available statistics
START THE NEW YEAR RIGHT
WITH A Walter Ashe TRADE-IN DEAL

"SURPRISE" TRADE-IN ALLOWANCES OFFERED ON YOUR USED EQUIPMENT

NO MATTER WHAT YOUR PREFERENCE in Receivers or Transmitters a Walter Ashe Trade-In deal will enable you to obtain the outfit of your choice at a really important saving! With every reputable make and model to choose from simply indicate your preference and tell us what you have to trade. We'll respond with an extra liberal offer that's sure to please you. For top allowances on your used equipment see Walter Ashe first ... before you make that trade. Act now. Write, write or phone today!

WRITE FOR COMPLETE LIST OF SUPER BARGAINS IN SURPLUS EQUIPMENT

AMAZING BARGAINS in Top Condition, Slightly Used Receivers. Write for list of goods-as-new merchandise now available.

SURPLUS PLATE TRANSFORMER
An ideal power transformer for exciter or small transmitter applications. Sec. 1400 or 1200 volts - 1 T-rated conservatively at 260 MA. Hermetically sealed steel case with screw terminals. 115 VAC 60 T Primary. Shpg. Wt. 16 lbs. (No. 8931) ONLY $7.95

ONLY

IT'S HERE!

SURPLUS T-17B CARBON MIKES
A single button carbon hand mike with push button on handle. Complete with cord and plug, brand new in factory box. Shpg. Wt. 5 lbs. ONLY ... $0.69

"ZERO BEAT" by Walter Ashe

Like everyone else we appreciate a "pat on the back" if deserved. When a pleased customer makes an entirely unsolicited comment in our behalf, naturally we're grateful. Here are a few recent expressions from customers:

No question about it... Walter Ashe gives you the best deal.

I appreciate the prompt consideration given my letter.

Your motto of "prompt service" is no idle boast.

I appreciate your courteous and prompt service on phone orders.

I wish to express my thanks for the F.H. trade-in.

And from Canada:

"I consider the fastest service you received from any point in the U.S."

Good-will like this can't be bought at any price. It springs from the genuine satisfaction of the purchaser. And it's one of the best Justifications we know of for seeking your patronage.

FOR PRIORITY DELIVERY OF THE 1948 ARRL "RADIO AMATEURS HANDBOOK" AND EDITORS AND ENGINEERS "RADIO HANDBOOK," PLACE YOUR ORDER NOW!!!
A precision built resonant cavity wavemeter tuning from 150 to 210 mc. Has calibration charts, electron eye tuning indicator and a 110 volt 60 cycles 85 ma. power supply.

A lower chassis contains 14 tubes and numerous units not required for wavemeter operation. Supplied with diagram and a beautiful heavy plywood carrying case, 9½" x 30" x 22½" high, which makes an excellent tool chest. These units are BRAND NEW in original boxes. Shipping weight 214 lbs.

TERMS --- Cash with order, or 25% deposit --- Balance C. O. D.

An exceptional value at only $14.95

150 to 210 M.C. Wavemeter

BC-1073-A

Stock No.
B-780

Moss Radio School
271 Huntington Ave., Boston 15, Mass.


Send for Catalog
Licensed by Commonwealth of Mass.
Department of Education

Mass. Radio School

show only about 100,000 television receivers now in use, and we believe that the seriousness of this harmonic problem should be recognized by the Commission before it is too late and that correction should be made to take care of it in the allocations before the number of television receivers is measured in millions rather than thousands. In our letter of September 13, 1947, responding to the Commission's Notice of Proposed Rule Making, we originally suggested that the allocation for Channel 2 be changed to 50-56 Mc. and that the amateur band be changed to 50-60 Mc., thus permitting harmonics from the amateur 28-Mc. band to fall within an amateur band. In making this proposal we very well aware that such a change not only would require retuning two television transmitters now operating on Channel 2 but would also necessitate readjusting receivers to respond to the new channel assignment. Equally important, under the new regulations of Atlantic City the Commission would not be free to assign 50-54 Mc. to any service except amateur unless there was unanimous agreement of the nations of the American Region to derogate in such respect. We feel, however, that even these difficulties were not insurmountable and that, once the Commission realized how serious this harmonic-interference situation can become, it too would favor such a reallocation despite the difficulties.

Upon further consideration, however, we now wish to recommend for the Commission's consideration that it continue present Television Channel 1 and eliminate Channel 2 instead, assigning 54-60 Mc. to fixed and mobile.

Under this recommendation it will still be necessary to change the frequency of the television transmitters operating on Channel 2, but the really difficult problems would disappear: no changes in any receivers would be required; and, since the amateur band could be left at 50-54 Mc., no derogations or arrangements between nations in the Americas would be needed to make assignments not contemplated in the Atlantic City regulations. Our present proposal would have the additional very great advantage that second harmonics from industrial, scientific and medical equipment operating on the international assignment at 27 Mc. also would not fall in a television channel. Under both the existing allocation and the Commission's proposal these harmonics are as great a threat to television reception as amateur harmonics.

We realize that under our present recommendation, second harmonics from the amateur 28-Mc. band would fall in frequency regions assigned to the fixed and mobile services. However, our past experience shows that this situation will not present any serious problems. The fixed and mobile channel-widths are very small, and if interference did arise a small shift in the fundamental frequency of the amateur transmitter would clear the fixed or mobile channel in that vicinity. This is not possible with a television channel that occupies a space greater than the entire second-harmonic region of the 28-Mc. band. Also, there is on a statistical basis an extremely small chance of harmonic interference to fixed and mobile as compared to the probability of such interference to television reception.

It might be objected that the ARRL proposal does not provide a satisfactory answer to the problem of interference from fixed and mobile services operating on channels adjacent to a television channel. We understand that presently this is a most serious consideration. However, we firmly believe that the far more distressing problem is that of harmonics from other services that fall inside a television channel. Some 25,000 amateur stations and an unknown but undoubtedly large number of IBM installations are potential sources of interference to Channel 2. While the number of fixed and mobile stations also undoubtedly will be large, it should be realized that each amateur station and IBM installation corresponds to a fixed or land station and occupies an area much larger than the entire second-harmonic region of the 28-Mc. band. Also, there is on a statistical basis a much smaller chance of harmonic interference to fixed and mobile as compared to the probability of such interference to television reception.

Another factor that should be given consideration in the question of adjacent-channel interference is the effect of receiver selectivity. It was brought out at the June engineering conference that it is technically feasible to increase the

(Continued on page 140)
in the greatest purchase of radio transmitting crystals every one made by a wholesaler in the history of the Radio Parts Industry. Sun Radio acquired title to over a half million dollars ($300,000,000) of Army Surplus, precision built, exactly matched crystals in moisture proof holders which are shock mounted. Please note that crystal shipments of 6 or less are packed in cloth containers to expedite handling. No worry because all crystals are shock mounted and guaranteed delivered perfect. These crystals have been treated by Sun's unique methods for deriving the correct fundamental frequency in kilocycles.

CRYSTALS WITH A MILLION USES

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Fractional Omitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>kc</td>
<td>kc kc kc kc</td>
</tr>
<tr>
<td>412</td>
<td>420 429 437 445</td>
</tr>
<tr>
<td>413</td>
<td>420 429 437 445</td>
</tr>
<tr>
<td>414</td>
<td>420 429 437 445</td>
</tr>
<tr>
<td>415</td>
<td>420 429 437 445</td>
</tr>
<tr>
<td>416</td>
<td>420 429 437 445</td>
</tr>
<tr>
<td>417</td>
<td>420 429 437 445</td>
</tr>
<tr>
<td>418</td>
<td>420 429 437 445</td>
</tr>
<tr>
<td>419</td>
<td>420 429 437 445</td>
</tr>
</tbody>
</table>

Price at a fraction of the cost of their holders alone.

- Payments must accompany order. Enclose 94¢ for postage and handling. Minimum order $2.00 plus postage.
- Crystals are always shipped in cloth bags inasmuch as they are shock mounted. All shipments guaranteed.

FM TRANSMITTER

BC-684

These units are BRAND NEW, providing 331 watt output, 10-channel push-pull circuit, crystal control employing NONLINEAR MODULATING COIL. This unit tunes from 27 to 8.9 mc. These units come complete with tubes less power supply, covers, and crystals. Excellent 10-meter FM transmitter for "Ham" radio fan. Police use $24.95.

442 SCR-522 VHF TRANSCEIVER

This is the most all-purpose equipment on the surplus market. Tuned 150-1500 Mc. Doesn't confuse these with other incoherent and incoherent Sun Radio offers electronically perfect and guaranteed $228... AND COMPLETE with tubes (one 10 tube superheterodyne receiver with microphone circuit and one 2 tube transmitters, remote control box, 28 volt dynamotor can be converted to 110 volt operation, 4 crystals and ALL CABLE CONNeCTORS. Price $99.95.

NAVY VHF CW TRANSMITTER BRAND NEW!

Battery operated (7 ½ V. "B" and 1 ½ V. "D") Frequency 80 to 105 Mc. Complete with 2-1104 tubes and full instruction manual. Price $6.95 each.

PORTABLE AMPLIFYING MEGAPHONE


100 WATT BENIXX TRANSMITTER

RA-12

Two tubes, hot line coupling. All vacuum tubes, crystal, calibration chart from 125 to 5 for 600 watts output. One 2.2 2.2 2.2 watt amplifier. Price $37.50.

BC-211 FREQUENCY METER

A heterodyne frequency meter complete with tubes, crystal, calibration chart from 125kc to 20 mc, with guaranteed accuracy of ± 1% or 100 cycles, whichever is greater. Alone is slightly but perfect and A-1 $37.50.

FOR THE ENTHUSIAST

Re-entrance Speaker

6 Watt PM driver unit housed in a metal weather proof baffle. 6 ½" dia. aluminum cone, 1 ¼"diameter, 6 ½" long, cone coil 15 ohms. Ideal for commercial receivers and public address applications $6.95.

100 WATT HEADPHONES P-20

Brand New Signal Corp 4000 ohm magnetic headphones. 8 ohm model with standard phone plug. Headphones are adjustable in any quantities of 6 $6.79 each.

MAGNETIC HEADPHONES P-20

Price $1.49 each. $13.50 value for quantities of 6 $6.79 each.

TERMS: All items F.O.B., Washington, D.C. All orders $30.00 or less, cash with order. Above $30.00, 25 per cent with order, balance G.D.O. Foreign orders cash with all orders, plus exchange rate.

MICROPHONE T-17

Brand new single button carbon hand mike by "Shure" with push to talk switch $9.95.

SUN RADIO

OF WASHINGTON, D.C.

938 F STREET, N.W. WASH. 4, D. C.
These transformers are suitable for use with type 811, 809, TZ40, TZ20, etc., to modulate either triode or beam tube RF amplifiers. Two secondaries are provided. Impedance ratio primary to secondary number one, 2 to 1. Primary to secondary number two, 16 to 1. Will modulate up to 300 watts input.

Modulation transformer, driver transformer, circuit diagrams and other information all for $6.90 Please include 50 cents for postage and handling.

Send full amount to speed delivery and save C.O.D. charges. Shipped only in the U. S., its possessions and Canada.

ELECTRONIC NAVIGATION, INC.
Box 735, Church Street Station
New York 8, New York

MODULATION & DRIVER TRANSFORMERS

adjacent-channel rejection of a television receiver. It was also quite clear at that conference that receiver manufacturers are unwilling to incorporate those features that would make for better performance in this respect because of a relatively small increase in cost involved. In asking for the lion's share of an exceedingly valuable portion of the radio spectrum, it is surely not unreasonable to expect that, in return, television receivers should be built to a standard that will make it unnecessary for other portions of the spectrum, not used by television, to be wasted. A worth-while increase in receiver selectivity is acknowledged to be well within the present state of the art. If the same were true of harmonic suppression the League would have much less reason for appearing at this hearing.

But aside from these considerations, a closer study of the ARRL proposal will show that the situation with respect to adjacent-channel interference is not as bad as superficial examination might indicate. For purposes of identification, let us call those areas in which Channel 2 (under the Commission's present proposal) is to be assigned, "primary metropolitan areas"; those areas where Channel 3 is to be assigned, "secondary metropolitan areas"; and those areas where neither Channel 2 nor Channel 3 will be assigned, "all other areas." Under the ARRL proposal, the allocation plan as set up by the Commission in Appendix C would be modified only by substituting Channel 1 for Channel 2. Thus the copy of this statement which we shall file with the Commission there is attached a chart showing the probable assignments as they would be effectuated in the event the Commission adopts the ARRL proposal.

In "primary metropolitan areas" the allocation pattern would call for Channels 1 and 4 to be assigned. In these areas, fixed and mobile stations operating in the 54–60 Mc. band would be separated from Channel 1 by the 4-Mc. width of the amateur band, and separated from Channel 4 by the 6-Mc. width of unused Television Channel 3. Thus there would be ample guard bands on either side of our proposed fixed and mobile assignment to prevent adjacent-channel interference. In the "all-other" areas where Channels 1, 3 and 4 would not be assigned, there would be no adjacent-channel problem of any kind. The regions where Channel 3 will not be assigned under the Commission's plan aggregate 89 per cent of the nation's population and over 97 per cent of the land area, by our estimate.

In the "secondary metropolitan areas" — those where Channel 3 is assigned — there is a possibility of adjacent-channel interference from fixed and mobile stations working in the 54–60 Mc. band. However, at least the lower 2 Mc. of this band would be useful, considering that a 4-Mc. guard band was considered sufficient in 1946. However, if there would be ample guard bands on either side of our proposed fixed and mobile assignment to prevent adjacent-channel interference. In the "all-other" areas where Channels 1, 3 and 4 would not be assigned, there would be no adjacent-channel problem of any kind. The regions where Channel 3 will not be assigned under the Commission's plan aggregate 89 per cent of the nation's population and over 97 per cent of the land area, by our estimate.

It is surely evident from consideration of these figures that adequate provision can be made for the fixed and mobile services from the standpoint of adjacent-channel interference. The judicial assignment of frequencies to fixed and mobile, taking into account the pattern of television channel assignments and the geography of the situation, should reduce interference of this type to a satisfactory minimum.

From the foregoing, it seems to us that objection to the ARRL proposal on the grounds of adjacent-channel interference is not such as to warrant undue concern. There is one special case that may be an exception. In the New York area the needs of the fixed and mobile services may be of such proportions that stations will have to be assigned frequencies immediately adjacent to the low-frequency edge of Channel 1. It has been said that allocations plans, particularly in this part of the spectrum, are necessarily shaped by the needs of metropolitan New York, since the "primary metropolitan area's" needs did not exist the solution of these allocations problems would be simple. We submit that if New York needs the ramified fixed and mobile services now being offered more fully than does it does a less dense area's needs, the elimination of Channel 1 in that area, in addition to the elimination of Channel 2, would completely solve the adjacent-channel problem in the section of the country where it is no doubt most acute. Furthermore, this would

(Continued on page 118)
The Sensational New 275 Watt Globe King... UNCONDITIONALLY GUARANTEE

10 DAY FREE TRIAL...

When you buy WRL equipment you are entitled to try it for ten days and if you are not entirely satisfied you may return it and your money will be gladly refunded. This new WRL—275 watt transmitter is a versatile advanced design that will give you top performance on 6, 10, 20, 40, and 80 meters, on CW and phone. It has RF exciter section capable of 40 watts input on all bands including 80 meters; RF final speech amplifier and modulator capable of modulating inputs from 300 to 350 watts; and the dual power supply. These sections can be purchased separately if you so desire. Comes in a gray streamlined cabinet. Size 23.4” high by 22” wide by 14” deep. For only $20.00 we will wire this kit complete ready to go and all you have to do is hook on the antenna, plug in your mike and you are on the air. Send today for a complete detailed description.

WRL Globe Trotter XMTR Kit
Amateurs the world over are praising the performance of this high quality, low cost kit. It’s a 40 watt input kit including all parts, power supply, chassis panel and streamlined cabinet. Write for export prices.
Cat. No. 70-300 less tubes.................. $69.95
Cat. No. 70-302 power supply, chassis panel and performance of this high quality, low cost kit. It’s a 40 watt input kit including all parts, power supply, chassis panel and streamlined cabinet. Write for export prices.

WRL Exciter Kit
From our own labs. Uses 6L6 regenerative Oes. into an 807 driver or final. Similar to unit described in A.R.R.L. Handbook. Outputs 35 to 40 watts. Comes mounted on standard relay panel 3¼" x 12¼".
Cat. No. 70-308 less accessories........ $19.95
Cat. No. 70-310 same as above, wired...$25.95
1 set of coils, meters, tubes, extra... $10.78
Power Supply wired with tubes........... $22.75

Get Acquainted Offer
New Giant Radio Reference Map
Just right for your control room wall. Approximately 4' x 3' contains major networks, time zones, amateur zones, leading shortwave stations, monitoring stations, etc.
MAIL COUPON TODAY and 25c
ATTENTION BROTHER HAM!

A Carrying Case for Your License. Real MOROCCO. Your call in 24k GOLD. Slim—compact. Just fits license. Two inserts. $1.00 Postpaid. Additional lettering 5¢ per letter.

CARR NOVELTIES
D. Carruthers—W2JA
236 Fifth Street
Ridgewood Park, N. J.

Did You Get It?
1948 Cat. No. 481
IF NOT—WRITE

ARE YOU LICENSED?

- When joining the League or renewing your membership, it is important that you show whether you have an amateur license, either station or operator. Please state your call and/or the class of operator license held, that we may verify your classification.

EXAMINATION SCHEDULE

The Federal Communications Commission will give amateur examinations during the first half of 1948 on the following schedule. Remember this list when you need to know when and where examinations will occur. Where exact dates or places are not shown below, information may be obtained, as the date approaches, from the Engineer-in-Charge of the district. Even stated dates are tentative and should be verified from the Engineer as the date approaches. No examinations are given on legal holidays. All examinations begin promptly at 9 A.M. except as noted.


Amarillo, Tex.: Apr. 7.

Anchorage, Alaska: Some time in March and June.

Atlanta, Ga.: 411 Federal Annex: Tuesday and Friday at 8:30 A.M.

Bakersfield, Calif.: Some time in February.

Baltimore, Md.: 508 Old Town Bank Bldg.: Monday through Friday. When code test required, 8:30 A.M.

Bangor, Me.: Some time in April.

Bemont, Texas: 329 P. O. Bldg.: Thursday, and by appointment.

Boston, Mass.: 1000 Customhouse: Monday through Friday.

Buffalo, N. Y.: 236 Federal Bldg.: Thursday.

Butte, Mont.: Apr. 23.

Charleston, W. Va.: Some time in March and June.

Chicago, Ill.: 248 U. S. Courthouse: Friday.

Port Arthur, Texas: Approved for G.I. training.
THE ENTIRE
DeMAMBRO STAFF
EXTENDS TO ALL
OUR FRIENDS....
SEASONS GREETINGS

DeMAMBRO RADIO SUPPLY CO.
A CAREER WITH A FUTURE!

TELEVISION

Shop Work • Shop Techniques • Theory
FULLY EQUIPPED LABORATORIES

- RADIO SERVICE & REPAIR
- F. M. & TELEVISION
- TRANSMITTER COURSES
Prepared for F.C.C. LICENSES
- RADIO TECHNOLOGY
A Junior College Level Course preparing for positions in Radio-Electronic Engineering Field.

MORNIN • AFTERNOON • EVENING CLASSES
MODERATE RATES • INSTALLMENTS
Available Under G. I. Bill
COME IN AND SEE OUR STUDENTS AT WORK

DELEHANTY SCHOOL OF
RADIO • ELECTRONICS • TELEVISION
105 EAST 13 ST., N. Y. 3, N. Y. • DEPT. T
LICENSED BY STATE OF NEW YORK

ELECTRICITY

FOR RADIO AND ELECTRONIC APPLICATIONS
ONAN ELECTRIC GENERATING PLANTS
Supply electric service for electronics applications and general uses, mobile or stationary. Driven by ONAN 4-cycle gasoline engines, they are of single-unit, compact design and sturdy construction.
ONAN Electric Plants are available in many sizes and models. ALTERNATING CURRENT: 500 to 35,000 watts in all standard voltages and frequencies. DIRECT CURRENT: 500 to 10,000 watts, 115 and 230 volts. BATTERY CHARGES: 500 to 3,500 watts; 6, 12, 24 and 32 volts. Write for detailed literature or engineering assistance.

D. W. ONAN & SONS
4447 Royalton Ave., Minneapolis 8, Minn.

- LEARN CODE -
SPEED UP YOUR RECEIVING
with
G-C Automatic Sender Type S
$20.00 Postpaid
Adjustable speed control, maintains constant speed at any setting. Complete with ten rolls of double perforated tape. A wide variety of other practice tapes available at 50c per roll.

GARDINER & COMPANY • Box 56
STRATFORD, NEW JERSEY

Cincinnati: Some time in February and May.
Cleveland, 541 Federal Bldg.: First and third Fridays each month, also by appointment.
Columbus, Ohio: Some time in January and April.
Corpus Christi: Mar. 11, June 10.
Cumberland, Md.: Apr. 8.
Dallas, 500 U. S. Terminal Annex: Monday through Friday.
Davenport: Some time in January and April.
Denver, 521 New Customhouse: First and second Thursdays each month, also by appointment.
Des Moines: Jan. 8, Apr. 8.
Detroit, 1029 New Federal Bldg.: Wednesday and Friday.
Ft. Wayne: Some time in February and May.
Fresno: Mar. 17, June 16.
Grand Rapids: Some time in January and April.
Harford, Conn.: Some time in March.
Honolulu, 609 Stangengal Bldg.: Monday, also by appointment.
Houston, 324 U. S. Appraisers Stores Bldg.: Tuesday and Friday.
Indianapolis: Some time in February and May.
Jacksonville: May 4.
Juneau, Alaska, 6 Shattuck Bldg.: By appointment only.
Kansas City, SSB U. S. Courthouse: Friday.
Klamath Falls, Ore.: Some time in May.
Knoxville, Tenn.: Mar. 10, June 9.
Las Vegas, Nev.: Some time in April.
Los Angeles, 539 U. S. P. O. and Courthouse Bldg.: Wednesday at 9 A.M. and 1 P.M.
Miami, 321 Federal Bldg.: Monday and Thursday.
Milwaukee: Some time in January and April.
Mobile: May 19.
New Orleans, 400 Audubon Bldg.: Monday through Friday; when code test required, Monday, Tuesday, Wednesday, Thursday and Friday at 8:30 A.M.
New York, 749 Federal Bldg., 611 Washington St.: Monday through Friday.
Norfolk, 402 Federal Bldg.: Monday through Friday; when code test required, Friday only.
Omaha: Jan. 15, Apr. 15.
Philadelphia, 1008 Customehouse: Monday through Friday, 9 A.M. and 1 P.M.
Phoenix, Ariz.: Some time in April.
Portland, Or.: Some time in April.
Portland, Ore., 406 Central Bldg.: Friday at 8:30 A.M.
 Reno: Apr. 21.
Roanoke: Apr. 3.
St. Paul, 208 Uptown P. O. Bldg.: Friday.
Salt Lake City: Mar. 20, June 19.
San Diego, 320 T. & S. Customhouse: By appointment.
San Francisco, 323-A Customhouse: Monday and Friday.
Class A, Monday through Friday.
San Juan, P. R., 323 Federal Bldg.: Thursday.
Savannah, 214 P. O. Bldg.: By appointment.
Seattle, 801 Federal Office Bldg.: Friday.
Spokane: Apr. 21.
Syracuse, N. Y.: Jan. 7, Apr. 7.
Tampa, 410 Main P. O. Bldg.: By appointment.
Tucson, Ariz.: Some time in April.
Washington, D. C., 2095 Temporary L Bldg.: Monday through Friday, 8:30 A.M. to 6 P.M.
Wichita: Mar. 11.
Wilmington, N. C.: June 5.

DELAYED MAIL

Mail service is quite poor these days. We've had numerous cases of delayed letter or ballot

(Continued on page 148)
UP TO 150 WATTS
YOU CAN HAVE TOP PERFORMANCE
ON ALL BANDS!

WITH B & W TURRETS

It takes an Air Inductor to give you top performance, and now, regardless of the power you're using, or plan to use, you can have it on all bands—with the proper B&W Turret Assembly. Through the years, the B&W Turret line has been improved and enlarged—and has consistently grown in popularity.

So, if you're building a new rig, or revising your present one, start right by providing for the proper B&W Turret that offers all these advantages and more:

• Pre-assembled, pre-wired and tested at the factory. Quick to install and quicker to shift bands for you after installation.
• Select 80, 40, 20, 15, 11 or 10 meter band by the flip of a switch. (11 and 10 meter bands covered by 10 meter coil.)
• Switch design shorts unused coils—eliminating absorption effects.
• Complete assembly arranged for panel mounting through 3/8" hole—provides panel control for quick, positive band switching.
• All B&W Turret types may be tuned on all bands by condensers having an effective capacity of 50 mmfd.

WRITE FOR BULLETINS giving full details on:
B&W "Baby" Turrets (up to 25 watts)
B&W "Band Hoppers" (up to 75 watts)
B&W 75-watt Turrets
B&W 150-watt Turrets

BARKER & WILLIAMSON, Inc.
237 FAIRFIELD AVENUE • UPPER DARBY, PENNA.

SIMPSON MODEL 240
"HAMMETER"

... greatest instrument value on today's market—

Here is today's version of the famous Simpson "Hammeter"—first self-contained pocket portable instrument built expressly to check high voltage and all component parts of transmitters and receivers. At today's price you cannot afford to be without it.

RANGES
VOLTS A.C. VOLTS D.C. MILLIAMPERES D.C.
0-15 0-15 0-15
0-75 0-75 0-75
0-750 0-300 0-300
0-3,000 0-750 0-750

Ohms: 0-3,000 (center scale 30) 0-300,000 (center scale 3,000)
Size: 3" x 5½" x 2½"
Price, complete with test leads .................. $21.75

SIMPSON ELECTRIC COMPANY
5200-5218 W. Kinzie St, Chicago 44, Ill.
In Canada, Bach-Simpson Ltd., London, Ont.

ASK YOUR JOBBER
mail and many difficulties in the delivery of QST, with complaints of slowness or nonreceipt. By trying hard at Hq. we are generally succeeding in all of these matters in doing our part in the normal manner, and the fault lies with an overloaded mail service which is generally groaning throughout the country. If you will try to be patient and wait just a few days longer . . .

Parallel Standing Waves

(Continued from page 49)

On lower powers the entire transmitter input can pass through the line trap. The load should be worked out or, if possible, an a.c. ammeter connected in the 115-volt a.c. line and a reading taken. Perhaps a good many hams will be surprised to find how much power is demanded. A little bit for this filament and a bit more for that C-bias pack add up!

The table below gives data for winding the tuned coil in the line trap with various sizes of wire (close-wound) for the several amateur bands. The untuned coil is simply wound over the tuned coil for its entire length. It would be wise to give the coils a good coat of coil dope or white shellac. It will be clear from the table that a single coil-and-condenser combination can be chosen to cover two adjacent bands.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Length</th>
<th>Capacitance</th>
<th>Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 8 d.c.c. wire; carrying capacity 30 amp.</td>
<td>1½&quot;</td>
<td>1&quot;</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2&quot;</td>
<td>2½&quot;</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2½&quot;</td>
<td>60</td>
<td>14 Mc.</td>
</tr>
<tr>
<td></td>
<td>4&quot;</td>
<td>240</td>
<td>3.5 Mc.</td>
</tr>
<tr>
<td>No. 12 d.c.c. wire; carrying capacity 13 amp.</td>
<td>1&quot;</td>
<td>1½&quot;</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2&quot;</td>
<td>1¼&quot;</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2½&quot;</td>
<td>60</td>
<td>14 Mc.</td>
</tr>
<tr>
<td></td>
<td>4&quot;</td>
<td>240</td>
<td>3.5 Mc.</td>
</tr>
<tr>
<td>No. 14 d.c.c. wire; carrying capacity 8 amp.</td>
<td>1&quot;</td>
<td>½&quot;</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>1½&quot;</td>
<td>60</td>
<td>14 Mc.</td>
</tr>
<tr>
<td></td>
<td>2½&quot;</td>
<td>60</td>
<td>7 Mc.</td>
</tr>
<tr>
<td></td>
<td>4&quot;</td>
<td>240</td>
<td>3.5 Mc.</td>
</tr>
</tbody>
</table>

It would be extremely nice to be able to cite a few simple rules and write down a couple of elementary formulas, the application of which would solve all antenna problems. Unfortunately, every antenna, because of its surroundings, method of feeding, and so on, is a separate and distinct case. There is an engineering wisecrack containing some wry humor and a great deal of truth which says that antenna work is an equation having an infinite number of variables each one of which is infinitely variable. It’s not quite that bad but there is no easy way out. On the other hand there is no black magic about it. Everything that happens happens for a good reason. If we make a methodical step-by-step search for the reason we will end up by finding it.

After we have found it, some more step-by-step investigation will find a cure. It can be an infuriating business but it is always worth it — those DX stations will tell you so.
FOR IMMEDIATE DELIVERY!

INDUSTRIAL and TELEVISION

POCKETSPOCE
MODEL S-II-A

by WATERMAN! — An OSCILLOSCOPE of UNUSUAL VERSATILITY, UTILITY and PERFORMANCE

A 3 INCH OSCILLOSCOPE for MEASURING AC and DC!

AMPLIFIERS for vertical and horizontal deflection as well as intensity... Linear time sweep from 4-cycles to 50-kc with blanking of return trace... Sensitivity up to 100 mv/in... Fidelity up to 350-kc through amplifiers... Attenuators for AC and for DC... Push-pull amplifiers... Anti-astigmatic centering controls... Trace expansion for detail observations. Completely stable regarding line voltage fluctuations and manipulations of controls, either internal or external........... $99 F. O. B., PHILA.

WATERMAN PRODUCTS Co., INC.
PHILADELPHIA 25, PA.

TABLE-MATES

EM-100 MODULATOR $58.00 COMPLETE

VX-101 DE-LUXE $118.50 COMPLETE

THE IDEAL COMPANIONS

- 5 BANDS—VFO OR XTAL
- 20 WATTS—PHONE OR CW
- BAND SWITCHING

- HIGH-LEVEL PLATE MODULATION
- MODULATION TUBE LINE-UP 6SJ7, 6C5, 6N7, 6G6's PP, CLASS AB1, 5Y3

Write for BULLETIN 'M'
DEC. QST AD FOR DETAILS OF VX 101

ELECTRO-MECHANICAL MFG. CO.
20-29 STEINWAY STREET, L. I. C. S., N. Y.
QSO across the Delaware River was made by W2VX and W3FGQ. The boys had a little trouble and a lot of fun finding the band and one another, but they are now getting signals nearly comparable with those obtained with similar equipment on 144 Mc.

V.H.F. Sweepstakes, Jan. 17th–18th

"Sounds like a great idea, but why in January, when conditions are at their poorest?" Such was the comment heard when the date of our first V.H.F. Sweepstakes (see complete details elsewhere in this issue) was announced. Well, that was just the idea—to get some of the gang, who might not otherwise bother, to fire up and see what can be done when the v.h.f. bands aren't hot.

DX adds spice to our v.h.f. work, but unless we maintain consistent local activity, there will be few stations ready to go when DX conditions break. Let's help to keep our v.h.f. bands active by getting on and seeing how many stations we can work in the V.H.F. SS, whether conditions are good or bad. There'll be more contests next spring and summer.

How's DX?

(Continued from page 87)

on 28 Mc. Back from Truk is W8WEA and he will answer all QSLs shipped to the given QTH in San Diego. Previously, it had taken an average time of three months for him to receive cards, all of which have been answered. So save your hair, don't despair.Via W4-CCH, VQ8AB remarks that he is in the Chagos Island Group, not Mauritius. The place isn't exactly on Times Square, either—he gets mail once every six months! W9TVK's "vacation" from Harvard this summer turned into a thrill story again: W2UZN didn't think he could work DX with his little 807 until Bob is going down to 50 Mc. with a small pair of 304 TLs driven by a VT-127 A. Out in Bellingham, W7EY's says he keeps building too much to raise an impressive country total. Must be out after an S9 DXCC! Bob is going down to 50 Mc. with a small pair of 304 TLs driven by a VT-127 A. Which is the quickest way to go bats, chase DX or work con-
HY-LITE STUDIOS
1471 SEABURY PL., BRONX 60, N. Y.

ATTENTION • ALL HAMS AND SWL'S

- ALL-ALUMINUM
- FULLY ADJUSTABLE
- PERMANENT
- STRONG AND RIGID

"You can't work 'em if you can't hear 'em."
With a HY-LITE ROTARY BEAM you will hear
and work 'em.

Built of rigid aluminum castings and tubing
the HY-LITE ROTARY BEAM is light weight and
will stand strains many times greater than
encountered in actual use.

Compare these specifications: The crossarm
and center supporting frame is of heavy, high
grade aluminum castings, with 1 inch aluminum
tube connectors. The elements are 7/8 inch and
1/2 inch telescopic aluminum tubes for the 6,
10-11 meters and 7/8 inch and 4 inch telescopic
aluminum tubes for 20 meters. The spacing be­
tween the elements is .10 for the director and
.15 for the reflector and adjustments are easily
made with Allen set screws with the wrench
supplied. Complete instructions are supplied
with each HY-LITE ROTARY BEAM. Heavy rubber
clamps on Steatite insulators rigidly support

If YOUR DEALER CAN'T
SUPPLY YOU...
Stacked arrays can be had or easily added
to your first HY-LITE BEAM. 20, 10-11, 6 meter
beams are now available. HY-LITE ROTARY
BEAMS are made right and priced right...

YOU'RE INVITED TO EXAMINE A HY-LITE
ROTARY BEAM TODAY AT YOUR FAVORITE
HAM STORE.

YOU CAN'T WORK 'EM IF YOU CAN'T HEAR 'EM.

WRITE US... FOR OUR
LOW PRICES AND CATALOG
WITH VARIOUS COMBINATIONS

UNIVERSAL SCORES AGAIN!
Brand new, wanted items at unbelievable savings. Every item guaranteed exactly as
advertised. Order with confidence from Universal.

KENYON
FILAMENT TRANSFORMERS
2½ Volt, 10 Amps, 20,000 Volts insulation.
$4.00

7½ Volt, 12 Amps, 20,000 Volts insulation. Can be changed to 5
Volts by removing a few turns.
$6.00

7½ Volt, 22 Amps, Open core type with 20,000 Volts insulation.
$3.25

A Rare Buy!
Plate Transformer
3200 Volt, center tapped.
1600 Volts at 350 MILS output.
$10.00

Oilmite Condenser
Tobe, 1 MFD 600 Volt DC. Very special—
49¢
(20% DEPOSIT WITH C.O.D. ORDERS)

KENYON
20 Henry 300-MA, 15,000 V Ins.,
Filter choke, shielded case and
standoffs, shipping weight 40 lbs.
$5.95

Plate Transformer
3200 Volt, center tapped.
1600 Volts at 350 MILS output.
$10.00

Oilmite Condenser
Tobe, 1 MFD 600 Volt DC. Very special—
49¢

(20% DEPOSIT WITH C.O.D. ORDERS)

Universal has many other rare buys.
Mail your "want list" today.

Universal and Supply Co., Inc.
715 South 7th St.
"Serving America's Hams"
Louisville 3, Ky.
U.H.F. RESONATOR CO.
Pre-Tuned—Pre-Spaced—PreMatched
High-Power Beams Use Wide Maximized Spacing

NO TUNING TO DO!
Beam clamps, 3 inch Dural tubing rotating mast, and bearings, available. Make up your own combination 10 Over 20, 6 Over 10, etc. Literature shows low-cost no-loss two inch open line flex. connection, all your RF power guaranteed out front.

Amateur net prices, 10-meter beams: 3 el. beam, length 12 ft., weight 9½ lbs., $35. 4 el. beam, length 20 ft., weight 13½ lbs., $50. 5 el. beam, length 29 ft., weight 25 lbs., $65. 3 el. 20-meter beam, 23 ft. long, 39 lbs., $100. For shipping prepaid anywhere in U.S.A. or Canada add $10 deposit on returned box, less outgoing shipping charges.

MAIL ADDRESS GUION ROAD, RYE, N. Y.
ALL LETTERS ANSWERED PERSONALLY
U. H. F. RESONATOR CO.
W. F. Holington, W2AV
FACTORY AT PORTCHESTER, N. Y.

U. H. F. RESONATOR CO.
Pre-Tuned—Pre-Spaced—PreMatched
High-Power Beams Use Wide Maximized Spacing

NO TUNING TO DO!
Beam clamps, 3 inch Dural tubing rotating mast, and bearings, available. Make up your own combination 10 Over 20, 6 Over 10, etc. Literature shows low-cost no-loss two inch open line flex. connection, all your RF power guaranteed out front.

Amateur net prices, 10-meter beams: 3 el. beam, length 12 ft., weight 9½ lbs., $35. 4 el. beam, length 20 ft., weight 13½ lbs., $50. 5 el. beam, length 29 ft., weight 25 lbs., $65. 3 el. 20-meter beam, 23 ft. long, 39 lbs., $100. For shipping prepaid anywhere in U.S.A. or Canada add $10 deposit on returned box, less outgoing shipping charges.

MAIL ADDRESS GUION ROAD, RYE, N. Y.
ALL LETTERS ANSWERED PERSONALLY
U. H. F. RESONATOR CO.
W. F. Holington, W2AV
FACTORY AT PORTCHESTER, N. Y.

- ALL-PURPOSE PORTABLE ELECTRIC POWER UNIT 3 KVA
  - Generator: 3KVA, 115, 120, or 125 volts, 3-phase, 60 cycles, 1200 r.p.m. (or 50 cycles at 1100 r.p.m.).
  - Engine: Gasoline, 4-cylinder (Hercules Model ZXB) 9.5 h.p.
  - Oil Filter, oil bath air cleaner; manual choke control; 6-v. battery (Battery not incl.). Oil filter, oil bath air cleaner; manual choke control; 6-v. battery (Battery not incl.).
  - Electric Characteristics: Wiring, lights, small motors (with "right"
  - Control Panel: main switch: circuit breaker and fuses; frequency meter; voltmeter and ammeter, charging am­
  - Equipment: starting motor and generator for generator: 3KVA, 115, 120, or 125 volts, 3-phase, 60 cycles, 1200 r.p.m.
  - Engine: Gasoline, 4-cylinder (Hercules Model ZXB) 9.5 h.p.
  - Weight, 8½ lbs., strong wood box. Refund on return of box, less outgoing shipping charges.

W. S. GOFF & CO.
390 Main Street
Worcester 5, Mass.

CLIPPER CHOKES and FILTERS
Triple speech power on carrier without over-modulation, as suggested in QST Nov. 1946, page 23.

SHIELDED CHOKE, 0.75 hr. 9% hi-alloy laminations high efficiency.
Model C-375 $4.75

COMPLETE FILTER ASSEMBLY, including laboratory selected choke C-375, capacitors C3, C4, C5 and terminating resistor R5, sealed in 1½" x 1¼" x 2½" shield can.
Model LP-3500, cut-off freq. 3500 cy. $5.95
Model LP-3500, cut-off freq. 3500 cy. $5.95

IMMEDIATE DELIVERY, postpaid in U. S. Preferably order through your jobber

Kenneth Richardson Laboratories
254 Vincent Avenue, Lynbrook, L.I., N. Y.

150

U.H.F. RESONATOR CO.
Pre-Tuned—Pre-Spaced—PreMatched
High-Power Beams Use Wide Maximized Spacing

NO TUNING TO DO!
Beam clamps, 3 inch Dural tubing rotating mast, and bearings, available. Make up your own combination 10 Over 20, 6 Over 10, etc. Literature shows low-cost no-loss two inch open line flex. connection, all your RF power guaranteed out front.

Amateur net prices, 10-meter beams: 3 el. beam, length 12 ft., weight 9½ lbs., $35. 4 el. beam, length 20 ft., weight 13½ lbs., $50. 5 el. beam, length 29 ft., weight 25 lbs., $65. 3 el. 20-meter beam, 23 ft. long, 39 lbs., $100. For shipping prepaid anywhere in U.S.A. or Canada add $10 deposit on returned box, less outgoing shipping charges.

MAIL ADDRESS GUION ROAD, RYE, N. Y.
ALL LETTERS ANSWERED PERSONALLY
U. H. F. RESONATOR CO.
W. F. Holington, W2AV
FACTORY AT PORTCHESTER, N. Y.
BEAUTY FOR DUTY

Model 33D Dynamic

The Turner Model 33D is designed with exceptionally smooth wide-range response and high effective output level. Ideal for critical applications where quality reproduction is desired. Excellent response to voice and music pickups. Engineered with Alnico magnets and Turner precision diaphragm. Entire circuit is well shielded to prevent extraneous pickup. Modern streamline design and rich satin chrome finish. Response: ±5db from 30 to 9000 c.p.s. Levels: 54db below 1 volt/dyne/sq.cm. at high impedance.

Complete with 20 ft. removable cable set. Also available as Model 33X with high quality crystal circuit.

Ask Your Dealer

THE TURNER COMPANY
917 17th STREET, N. E. • • • CEDAR RAPIDS, IOWA

Microphones BY TURNER

MODULATION METER
MODEL G 232
Price $47.00 Net (Including Test Leads)

Compact —
3¼" x 3½" x 2½"
Welded Aluminum
Alloy Case—Black
Alumilite finish
No Batteries used
Uses Crystal and
Copper Oxide
Rectifiers
Hermetically Sealed
Meter
Monitoring Jack
Designed for use up
to 300 Mc.

Monitors AM Modulation Percentage and Speech
Quality • Indicates Carrier Shift and Shows Posi­
tive and Negative Peaks • Individual Accurate
Calibration for both Voice and Sine Modulation.
Highest Quality Construction and Components

GABLES ENGINEERING, INC.
P. O. Box 791
Coral Gables, Florida

A. C. CURRENT ANYWHERE!
With Katolight Plants and Generators

COMMERCIAL RADIO INSTITUTE
A RADIO TRAINING CENTER FOR 28 YEARS
Resident Courses Only • Broadcast, Service, Aeronautical, Televi­
sion, U.H.F., Preparatory Course, Frequency Modulation and Marine
telegraphy classes forming for Mid-Year Term Feb. 2nd. Entrance
examination Jan., 12th.

Ham Post!

VHF-152 ...... $86.60
Hammarlund
HQ-129X ....... $77.30
Gen-s 10-11. 39.95
RME-45 ....... 198.70
Con-s 10-11. 39.95
Hallcrafters
SX42 ....... 275.00
Senar MB 611 .... 72.45
National
Senar VX680 .... 240.00
ST.45

 CONTINENTAL SALES COMPANY
195-197 CENTRAL AVENUE, NEWARK 4, N. J.

All hams are requested to submit lists, even if
they show only a small score, on a postal to help
support claims from others. Awards will be based
on individually-attained scores.

Report Results
Report to ARRL, West Hartford, Conn., as
soon as the contest is over. Use the log form in
the example.

Correspondence
(Continued from page 71)

OPERATING PRACTICES

I think it is about time for a good pep talk to our fellow
hams about needless QRM caused by fellows calling CQ
once every minute and a half and never listening to any
frequency except their own. This evening I called W7—
two times on such a deal. He was about 20 kw. from
my freq., and putting in an S9 signal here. When I turned the
receiver off he was still calling CQ.

You know a lot of us are still "rockbound," and I think
everyone should tune over the band following a CQ before
calling CQ again. Tuning the whole band will certainly
eliminate a lot of QRM and will add to the number of
contacts.

Roy Ayers, W4TYU

EDITOR-IN-CHIEF

I may have that you call an old-timer but I still like clean­
cut sending. I have been going over the forty-meter band
since I got out of the Signal Corps and it seems to me that a
lot of the boys have a habit of slurring letters, etc., together.
In the old days we used to call it "a banana-boat swing"; in
other words, you got part of it and filled in the rest and hoped
for the best. We are now getting a bunch of new hams who
are not quite up on chatter of our sort so why not give them
a lesson or two?

Verne J. Reynolds, W9AGB

97 Belgrave Drive, Kearny, New Jersey

Editor, QST:

W4GZV's opinion is of particular interest to me because I
discuss current events of national and international im­
portance on the amateur bands. Of course I believe that
"judicial prudence" should be observed in everything said
on the air. But leave us not be left with the idea that there
is an over-listening ear, absorbing our conversations with the
intention of slapping restrictions on those who do not
conform, in policy, with the powers that be.

Such thinking will put a conscious or subconscious fear
into the heart and mind of every thinking amateur. Many of
us fought and worked in the recent war and we reaped the
preservation of our ideals, one of which was freedom from
such fear. The amateur fraternity, I sincerely believe, is
a more-than-average-intelligence group, and I am confident
that it never will mistake liberty for license. Exchange of
views, whether on the street or via radio waves, is something
to be encouraged in a democracy such as ours.

We must never forget that whether we are amateurs,
veterans or part of any other group whatsoever, we are
always citizens first and as such must exercise the powers and
privileges granted us if we wish to preserve our way of living.

Emanuel Berger, W4QYU
To make a 13 cm. transmitter, plug a 2C40 tube into the DM-240-A oscillator, make filament, plate and antenna connections . . . you're ready to go!

To make a receiver, use the DM-240-A oscillator as a superregen detector in the separate-quench circuit. Or use it as the H. F. oscillator in a superhet!

New DX records are waiting to be made; new phenomena are to be discovered; new uses are to be found for these frequencies!

SEND FOR FREE FOLDER, 12-B.

Look for these Decimeter products coming soon
- Precision Wave meter for 13 cm. band.
- Oscillator for 25 cm. band.
- Precision Wave meter for 25 cm. band.
- Reaction Wave meter for 100 to 3000 Mc.

DECIMETER
1430 MARKET STREET DENVER 2, COLORADO

Trans-Atlantic...
(R-9 OR BETTER)
on 6 METERS

During a recent period when the MUF (maximum useful frequency) went up as high as 51 mc., station W1ATP in Holliston, Massachusetts, worked London and several California and Oregon stations with a signal strength of R-9 and better, using a Workshop 6-meter beam antenna. This is typical of the performance of Workshop antennas on all amateur bands.

Available through your regular dealer. Price $9.00

The WORKSHOP ASSOCIATES, INC.
Specialists in High-Frequency Antennas
66 NEEDHAM STREET, NEWTON HIGHLANDS 61, MASSACHUSETTS
THE ARROW 6-10-11 MTR 3 ELEMENT BEAM

- All Aluminum 3/4" tubing.
- All Aluminum Castings.
- Rigid Construction.
- Fed with 72 OHM Coax available from our surplus stock at lowest cost.
- Supplied with 6" mast of standard pipe, easily added to.
- Send $5.00, balance C.O.D. Immediate shipment.

Complete With 50 Ft. Coax and Instructions $29.50

DISTRIBUTORS WANTED
Antenna Position Indicator
Remote Electrical Operation

We can supply component transmitter and indicator units for use on 10 to 20 volt D.C. battery or rectified current. Distributors interested in quantity purchases will be considered for exclusive territory. Inquiries invited.

FRIEZ INSTRUMENT DIVISION OF BENDIX AVIATION CORPORATION
BALTIMORE 4, MARYLAND

COMPLETE RADIO TRAINING!
Prepare now to accept a responsible position in Commercial Radio. New developments will demand technicians with thorough basic training, plus a knowledge of new techniques discovered during the war. Training open to high school graduates or those with high school equivalency. Courses 6 to 18 months' duration in RADIO AND ELECTRONICS. Approved Veteran training in Radio. Write for particulars.

DEPT. TN
VALPARAISO TECHNICAL INSTITUTE
Valparaiso, Ind.

RADIO-ELECTRONICS TELEVISION • BROADCAST ENGINEERING

An Accredited Technical Institute nationally recognized for high calibre training. Prepares high school graduates for technical careers. Classes start every Monday. Comprehensive courses in Radio-Electronics Engineering, Broadcast and Television Engineering, Broadcast and Television Servicing; 2,100 hours classroom and laboratory study.

Write today for free informative booklet, "Radio Engineering As A Career."

CAPITOL RADIO ENGINEERING INSTITUTE
DEPT. QS-7, 16th STREET & PARK ROAD N. W. • WASHINGTON 10, D. C.

154
HAM-ADS

(1) Advertising shall pertain to radio and shall be of interest to radio amateurs or experimenters in that branch of the art.

(2) No display of any character will be accepted, nor can any claim of a patent, exclusive rights, or copyrights be made which would tend to make one advertisement stand out from the others.

(3) Closing date for Ham-Ads is the 25th of the second month preceding publication date. Only ads 75 words or less will be considered. (4) We reserve the right to edit all advertising by us. (5) All advertising in this column regardless of words may apply to radio equipment, parts, or apparatus offered for exchange or advertising inquiring for special parts, if by a member of the American Radio Relay League. Thus, advertising of bona fide members of the League for parts or apparatus offered for exchange or advertising inquiring for special parts, if by a member of the American Radio Relay League takes the 7th rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising by him takes the 7th rate. (6) Provisions of paragraphs (1), (2), (4), and (5), apply to all advertising in this column.

TRANSMITTING Keys; New, beautifully built, high quality Mac type 200 keys. Black crackle finish, heavy cast oval slug buttons, the type that doesn't require fastening down, it won't tilt. Switch lever for using 2 call positions on spare parts elsewhere plated. Adjustable bearings, heavy 3/16" silver contacts. A real buy. $1,00. Shipping wt., 1 lb. Please include money order. Ed. Dobben W9UHR, 258 Highland St., Hyde Park, Boston, Mass.

WANTED: National "NSM" modulator. Thorpe, W8JDG, 69 Ne Corner Ave., Chicago 14, IL.

FIRST $800 takes my KW/CW rig, Hallercrafters receiver, bug, tape machine and many duplicate miscellaneous parts, coils, meters, etc. Hammer time April 25th. R.S.F. Radio, 1050 Y. Avenue, Columbus, Ohio.

FOR SALE: 150-B converted for 20 and crystal mike. Price complete with tubes less crystal mike, $350. Packed in original carton, W9MO, 509 Hub St., Huntington Beach, California.

WANTED: FB-7 rev including 10 meter coils, R.O. Loken, W7PHQ, 4314 Meridian Ave., Seattle 3, Wash.

SRL new NC-240 D and SX-28-A used 3 months. In brand new condition with speakers. Doug Berry, 403 Ann, West Reading, Pa.

HAMMARLUND Super-Pro, army model in metal cabinet, 100-400 kc, 2-5-20 Mc, as is, $125. John Weber, 402 East Walnut, Kokomo, Indiana.

SELL, or swap NC-46 and speaker, Gen-set 10-11 rating cover, excellent condition. WQYY, 1806 Sterling Place, Brooklyn, N. Y.

SELL; Collins Model 30 transmitter, 300 watts, Now on the air on ten. $600. Mr. Paul Kincad, 912 Rhode Island, Lawrence, Kansas.

SELL: Collins model 150 transmitter and CW complete with tubes and coils. Price $600 f.o.b. Durham, N. C., WCEN, Box 38, Charlotte, N. C.

BC-610-D modified for 10 excellent condition, antenna changer over extra, 235 watts. W4ATB, 8703 Olympia Pl., College Park, Md., less than a month, $275, 4WRE, 425 Lightfoot Road, Louisville, Ky.

SELL Electrophone 1A receiver, good condition. $85. John Forrester, 210 West 79th St., New York City.


FOR Sale: Collins Model J01 transmitter, 300 watts. Now on the air on ten. Excellent condition. W2QQY, 1806 Sterling Place, Brooklyn, N. Y.


TELEVISION set for sale, 7'. First $200 check takes it. W2NRM, 7820 16th St., N. W., Washington, D. C.

SUPREME AP-100 xmitter, new, list $350. Sell for $450, with tubes, coils, and mike. R.o.b. or deliver in New York area. J. L. wide spaced berth in original box with manual. Will ship in 10 days. Price $150, BC-211 freq. meter, with Ac supply, $40. W9VWA, 112 E. 45th St., New York City.

HAMMARLUND Super-Pro, like new, Army rack model, complete, less speaker, A steal at $125. WZQJ, 71 Croxhill St., Staten Island, New York.

HAMCALLERS Stereo skyragmenter SK-25 and new R-42 speaker for sale. Clayton, 1946 W. 28th St., Cleveland, O.

COMPLETE 60 CW rig, 7 mc, BC-313 AC rev, both $60, f.o.b. W6UVP, R 1 Montrose, Cal.


FOR Sale: Collins Model J01 transmitter, 300 watts. Now on the air on ten. Excellent condition. W2QQY, 1806 Sterling Place, Brooklyn, N. Y.

FOR Sale: Collins Model 30 transmitter, 300 watts, Now on the air on ten. $600. Mr. Paul Kincad, 912 Rhode Island, Lawrence, Kansas.

FOR Sale: Collins model 150 transmitter and CW complete with tubes and coils. Price $600 f.o.b. Durham, N. C., WCEN, Box 38, Charlotte, N. C.

FOR Sale: Collins Model J01 transmitter, 300 watts. Now on the air on ten. Excellent condition. W2QQY, 1806 Sterling Place, Brooklyn, N. Y.

FOR Sale: Collins Model 30 transmitter, 300 watts, Now on the air on ten. $600. Mr. Paul Kincad, 912 Rhode Island, Lawrence, Kansas.

FOR Sale: Collins model 150 transmitter and CW complete with tubes and coils. Price $600 f.o.b. Durham, N. C., WCEN, Box 38, Charlotte, N. C.

FOR Sale: Collins Model J01 transmitter, 300 watts. Now on the air on ten. Excellent condition. W2QQY, 1806 Sterling Place, Brooklyn, N. Y.

FOR Sale: Collins Model 30 transmitter, 300 watts, Now on the air on ten. $600. Mr. Paul Kincad, 912 Rhode Island, Lawrence, Kansas.

FOR Sale: Collins model 150 transmitter and CW complete with tubes and coils. Price $600 f.o.b. Durham, N. C., WCEN, Box 38, Charlotte, N. C.

FOR Sale: Collins Model J01 transmitter, 300 watts. Now on the air on ten. Excellent condition. W2QQY, 1806 Sterling Place, Brooklyn, N. Y.

SELL BC-42D, modified to increase sensitivity, 5-meter and noise limiter added, $50, W4LAM, Thornton Hall, University of Va., Charlottesville.

BEST offer, S-38, new, $100, W2HDP, 3930 17th Ave., Oklahoma City, Okla.

SLS, SWLS, large variety of colors and designs. Also specialize in your own design. Guaranteed quality, good delivery time on standard items, send for catalog. Mesmerizing Comics, Inc., P.O. Box 529, Stockbridge, Mass.

NEW or used; all popular brands in stock. Hallcrafters, Hannamard, RME, Go-Set, Miller, Mesmer, others, send description of item required. Small order minimum, $5. Van Sickle Radio Supply, Indianapolis, 6, Ind.

WANTED marked BEAMS, BC-342D, modified Hammarlund, RME, Gon-aet, Millen, Meissner, others. Send description. W4LAM, Thornton Hall, University of Va., Charlottesville.

FOR SALE: ACRYLIC CRYSTALS: Add-etched, frequencies 400 kHz to 900 kHz, same size. Same price. Try us first. Wanted: Laboratory signal generator. Eidson for BEAM control cable, new material: 216-6 f20 rubber insulated, $50, W6EVE, Milwaukee, Wis.

FOR SALE: 24 ft. 18" square sections. 1800 volt/150 ma, $125, W6TFV, 4535 17th Ave., Brooklyn 6, N. Y.

FOR SALE or trade: National SW-3 drum dial: two matched condensers, $10, W4LAM, Thornton Hall, University of Va., Charlottesville.

FOR SALE: ALPINE 30 watt transmitter in excellent condition, complete 1920 thru 1939. All for $35, or what have you? Clarence R. Bond, 564 E. 46th St., Detroit, Mich.

HALLCRAFTERS DD-1 Dual Diversity 25-tube recvr. Truly the De Luxe of all receivers. Complete and guaranteed perfect condition. Selling as is, no more, no less, no trades. WERTM, RD 1, Ballston Lake, N. Y.

FOR SALE: Hallcrafters Sky Challenger, 55 C to 38 Mc. Very good condition. $70. C. Williams, WOBMN.

Mystery crystals, beginning our fifty-ninth year manufacturing finest quartz crystals for amateur, marine, police, aircraft, geophysical and other purposes. Send your requests or require descriptive today. Hallcrafters, Inc., 1104 Lincoln Place, Brooklyn 11, N. Y.

FOR SALE or trade: Nat'l SW-12, $300, NE2, Seattle, Wash.

FOR SALE or trade: 156 samples. Colortone QSLS, SMARTI New! Different for those who want the best! Colortone 960, 50 Shore Road, Stratford, Conn.

FOR Sale or trade: National SW-3 drum dial: two matched condensers, $10, W4LAM, Thornton Hall, University of Va., Charlottesville. Octo.

D. Hurley, 320 South Main St., Independence, Kans. MUST Sell: complete 45-watt Concord public address system, A-1 meters repaired. Springfield Testing Laboratory, 815 North 22nd St., Springfield, Ill.

FOR SALE: Hallcrafters Sky Challenger, 55 C to 38 Mc. Very good condition. $70. C. Williams, WOBMN.

WANTED: Laboratory signal generator. Eidson for BEAM control cable, new material: 216-6 f20 rubber insulated, $50, W6EVE, Milwaukee, Wis.

FOR SALE: Hallcrafters Sky Challenger, 55 C to 38 Mc. Very good condition. $70. C. Williams, WOBMN.

INSTRUCTOGRAPH with 11 tap•• and oscillator. Like new, $22. D. Morehead, 3119 Lincoln pl. dr., Des Moines 12, Iowa.


CRYSTALS: Acid-etched, BT cut. Frequencies 4100 to 9900 kHz, filtered. Send your requirement to oval OT243 or write hol- liders (4x lip spacing). Your frequency within 10 kHz. $1.50 f.o.b. no more, no less, no trades. W2LIE, 11131 E. 227 St., Elmont, L. I., N. Y.

FOR SALE: 156 samples. Colortone QSLS, SMARTI New! Different for those who want the best! Colortone 960, 50 Shore Road, Stratford, Conn.

FOR SALE: Hallcrafters Sky Challenger, 55 C to 38 Mc. Very good condition. $70. C. Williams, WOBMN.

INSTRUCTOGRAPH with 11 tap•• and oscillator. Like new, $22. D. Morehead, 3119 Lincoln pl. dr., Des Moines 12, Iowa.


CRYSTALS: Acid-etched, BT cut. Frequencies 4100 to 9900 kHz, filtered. Send your requirement to oval OT243 or write hol- liders (4x lip spacing). Your frequency within 10 kHz. $1.50 f.o.b. no more, no less, no trades. W2LIE, 11131 E. 227 St., Elmont, L. I., N. Y.

FOR SALE: 156 samples. Colortone QSLS, SMARTI New! Different for those who want the best! Colortone 960, 50 Shore Road, Stratford, Conn.

INSTRUCTOGRAPH with 11 tap•• and oscillator. Like new, $22. D. Morehead, 3119 Lincoln pl. dr., Des Moines 12, Iowa.


CRYSTALS: Acid-etched, BT cut. Frequencies 4100 to 9900 kHz, filtered. Send your requirement to oval OT243 or write hol- liders (4x lip spacing). Your frequency within 10 kHz. $1.50 f.o.b. no more, no less, no trades. W2LIE, 11131 E. 227 St., Elmont, L. I., N. Y.

FOR SALE: 156 samples. Colortone QSLS, SMARTI New! Different for those who want the best! Colortone 960, 50 Shore Road, Stratford, Conn.

FOR SALE: Hallcrafters Sky Challenger, 55 C to 38 Mc. Very good condition. $70. C. Williams, WOBMN.

FOR SALE: HALLICRAFTERS DD-1 Dual Diversity 25-tube recvr. Truly the De Luxe of all receivers. Complete and guaranteed perfect condition. Selling as is, no more, no less, no trades. WERTM, RD 1, Ballston Lake, N. Y.

FOR SALE or trade: National SW-12, $300, NE2, Seattle, Wash.


CRYSTALS: Acid-etched, BT cut. Frequencies 4100 to 9900 kHz, filtered. Send your requirement to oval OT243 or write hol- liders (4x lip spacing). Your frequency within 10 kHz. $1.50 f.o.b. no more, no less, no trades. W2LIE, 11131 E. 227 St., Elmont, L. I., N. Y.

FOR SALE: 156 samples. Colortone QSLS, SMARTI New! Different for those who want the best! Colortone 960, 50 Shore Road, Stratford, Conn.

FOR SALE: Hallcrafters Sky Challenger, 55 C to 38 Mc. Very good condition. $70. C. Williams, WOBMN.
RME-45, excellent condition. Best offer over $120. WEKNZ.

SURPLUS Barger's tuning knob for command set revue, $89.

SALVOS, 450 So. Alvarado, Los Angeles 6, Calif.

PLATE power transformers constructed for your requirements.

SALVOS, 450 So. Alvarado, Los Angeles 6, Calif.

SALVOS, 601 Kitchen, Box 219, 2nd Ave., New York 6, N. Y.

SELD, 25 long wave receiver, perfect $25. W9RS, 2405 East State St., Rockford, Ill.

SOLD, all coils, $1.250, f.o.b. WZLZ, 68 Halbert, Buffalo, N. Y.


SOLD, quality cards. Filled right, Samples, Ferri, W9ULT, 1768 Far Rockaway, N. Y.


SELL: Mark II transmitter, 40-80 meter, 235 M.C. 12 volt dynamotor, 110 volt A.C., $25. W1)VOY, Tracy, Minn.

SOLD, F/BOP, FM and AM detectors, crystal filter, perfect cond., asking $100. R. Bull, 110 Franklin Ave., Staten Island, N. Y.

SELL, Alligator SX-42, with Jensen speaker, $240.00. Miller, 41 Birchwood Dr., North Babylon, N. Y.

SELL, ARS military model S-36 receiver, 27 to 144 Megs, $50. W8JZB, 785 Woodbridge Ave., Detroit 26, Mich.

STOP, all coils, $3.50, f.o.b. W2LS, 67 Allerton Ave., Bronx 58, N. Y.


BC-22 frequency meters (without modulator) used, but each in good cond., $2.50; f.o.b. Memphis, Tenn. W. Betterworth, W4IWX, Box 2425

FOR Sale: HRO-W complete with new5 and cond., $50. R. Bettersworth, W4IIY, Box 4245


FOR Sale: SX-50A, 10 watt, 5 meter, New York Stock, $30. W2OXR, 282 Franklin Ave., Staten Island, N. Y.


FOR Sale: BC-100A, 10 watt, 40 meter, New York Stock, $25. W2OXR, 282 Franklin Ave., Staten Island, N. Y.

FOR Sale: BC-312, Converted for 110 AC Noise limiter, and Hi-Mike, $325.00, f.o.b. W2LB, 68 Halbert, Buffalo, N. Y.

FOR Sale: 5 meter, 50 watt, 4 band receiver, $200. W5RS, 2405 East State St., Rockford, Ill.


FOR Sale: SX-28, 10 watt, 80-40-20-10 meters, in good cond. and in use at present time, $150. All letters answered. Joseph H. Hoff, W7EZA, R. No. 1, Rockport, Conn.


FOR Sale: BC-100A, 10 watt, 40 meter, New York Stock, $25. W2OXR, 282 Franklin Ave., Staten Island, N. Y.

FOR Sale: BC-312, Converted for 110 AC Noise limiter, and Hi-Mike, $325.00, f.o.b. W2LB, 68 Halbert, Buffalo, N. Y.


FOR Sale: SX-50A, 10 watt, 5 meter, New York Stock, $30. W2OXR, 282 Franklin Ave., Staten Island, N. Y.


FOR Sale: BC-100A, 10 watt, 40 meter, New York Stock, $25. W2OXR, 282 Franklin Ave., Staten Island, N. Y.

FOR Sale: SX-28, 10 watt, 80-40-20-10 meters, in good cond. and in use at present time, $150. All letters answered. Joseph H. Hoff, W7EZA, R. No. 1, Rockport, Conn.


FOR Sale: SX-50A, 10 watt, 5 meter, New York Stock, $30. W2OXR, 282 Franklin Ave., Staten Island, N. Y.


FOR Sale: SX-50A, 10 watt, 5 meter, New York Stock, $30. W2OXR, 282 Franklin Ave., Staten Island, N. Y.


FOR Sale: SX-50A, 10 watt, 5 meter, New York Stock, $30. W2OXR, 282 Franklin Ave., Staten Island, N. Y.


FOR Sale: SX-50A, 10 watt, 5 meter, New York Stock, $30. W2OXR, 282 Franklin Ave., Staten Island, N. Y.


FOR Sale: SX-50A, 10 watt, 5 meter, New York Stock, $30. W2OXR, 282 Franklin Ave., Staten Island, N. Y.


FOR Sale: SX-50A, 10 watt, 5 meter, New York Stock, $30. W2OXR, 282 Franklin Ave., Staten Island, N. Y.


GUILLOTINE TUNERS

Developed by General Electric for high frequency circuits (Millen Nos. 46811 for oscillator and 46812 for RF stage) in receivers and converters.

See August 1947 issue of E.H. Ham News for details of application. The high-efficiency tunable circuit complete in one compact sturdy unit. The ideal answer to the 2, 6 and 10 meter band receiver tuned circuit problem.

JAMES MILLEN
MFG. CO., INC.
MAIN OFFICE AND FACTORY
MALDEN
MASSACHUSETTS

Index to Advertisers

Advance Electric & Relay Co. .................................................. 124
Allied Radio Co. ................................................................. 125
American Radio Institute ...................................................... 154
Arrow Electronics, Inc. ......................................................... 154
Atlee Radio Co., Water ......................................................... 137
Atwood Corporation, The ...................................................... 137
Barker & Williamson ............................................................ 145
Bennet Aviation Corporation .................................................. 154
Blish Electric Co. ................................................................. 142
Boland & Boyce ................................................................. 114
Bourns, Inc. ......................................................................... 128
Candle system ..................................................................... 128
Cauton Radio Engineering Inst. .............................................. 119, 128
Carey Navigation .................................................................... 122
Chicago Industrial Instrument Co. .......................................... 130
Clark Electric Co. ................................................................. 138
Cleveland Inst. of Radio Elec. ................................................. 132, 134
Columbia Radio Co. .............................................................. 160
Commercial Radio Institute ................................................... 132
Consortum Products Co. ........................................................ 103
Continental Sales Co. ............................................................ 132
Decimeter, Inc. ..................................................................... 153
Delmarva Institute ............................................................... 156
Dealmarco Radio Supply Co. .................................................. 143
DeWey &1 Amy Chemical Co. .................................................. 140
Drake Electric Works ............................................................ 140
Eitel-McCullough, Inc. ........................................................... 105
Electro-Mechanical Mfg. Co. ................................................. 147
Electronic Markets, Inc. ........................................................ 118
Electronic Navigation ............................................................. 140
Electronics, Inc. ................................................................. 149
Electro-Voice, Inc. .................................................................. 83
Gibbs Engineering, Inc. ......................................................... 152
Gardner & Company ............................................................. 144
General Electric Co. ............................................................... 80
God & Company, W. S. .......................................................... 100
Gore-Tone Company, The ..................................................... 126
Hallcresteners Company, The .............................................. 107
Hammattud Mfg. Co., Inc. ..................................................... 89
Harmon Radio Corp. ............................................................. 123
Harvey Radio Co. ................................................................. 117
Harvey-Wells Electronics ....................................................... 120
Harley & Young ................................................................... 129
Henry Radio Mfg. ................................................................. 131
Hy-Life Industries .................................................................. 149
Hytron Radio & Electronic Corp. ............................................. 9
Instructograph Co., The ....................................................... 146
International Resistance Co. ................................................. 104
Jensen Manufacturing Co. ...................................................... 108, 90
Johnson Co., L. F. ................................................................. 148
Johnson Sales, Art A ............................................................. 148
Kato Engineering Co. ........................................................... 162
Len-Ha ................................................................. 111, 115
Kenyon Transformer Corp. .................................................... 115
Knight Co., James ............................................................... 129
Leeds Radio Co. ................................................................ 129
Mallory & Co., P. R. ............................................................. 92, 93
Marvin Elec. Instrument Co. ................................................... 91
Mass, Radio & Telegraph School, Inc. .............................. 138
McLaughlin, J. L. A. ............................................................ 109
McMillen Radio Institute ....................................................... 130
Millen Mfg. Co., Inc., James ................................................ 158
Munro, J. E. ................................................................. 149
National Co., Inc. ................................................................. 143
Newark Electric Co. .............................................................. 127
Omnit Mfg. Company .......................................................... 107
Ohm & Sons, D. W. ............................................................. 144
P. and H. Sales Co. ............................................................... 140
Peerless Radio Distributors .................................................. 109
Peterseon Radio Co. ............................................................. 142
Port Arthur College .............................................................. 142
RCA Institutes, Inc. ............................................................. 148
Radio Corporation of America ............................................... 138
Radio & Tele Service Co. of Pa. ............................................ 148
Radio Mfg. Engineers ........................................................... 138
Radio Parts Distrib., Co. ....................................................... 148
Radio Products Sales Co. ...................................................... 148
Radio Jack, The .............................................................. 87, 96, 99
Richardson Laboratories, Ken. ............................................... 130
Kostan Corporation ............................................................. 136
Scientific Radio Products Co. ................................................ 134
Silver Co., Inc., McMurdo ..................................................... 136
Nippon Electric Company ..................................................... 145
Sonar Radio Co. ................................................................ 139
Sprague Products Co. ........................................................... 147
Standard Radio & Elec. Products ......................................... 138
Standard Transformer Corp. ................................................. 138
Steinberg's Inc. .................................................................. 133
Sun Radio & Electronics Co. ................................................ 108
Sun Radio of Washington ..................................................... 108
Terminal Radio Corporation .................................................. 121
Triplett Elec. Instrument Co. ................................................ 152
Turner Company, The ........................................................ 152
Tydings Company .............................................................. 152
U. H. R. Resonator Co. .......................................................... 107
United Electronics Co. .......................................................... 160
United Transformer Corp. .................................................... 149
Universal Radio Supply Co. .................................................. 149
Valparaiso Technical Institute ................................................. 154
Vestco Company ................................................................. 131
Vibroplex Co., The ............................................................. 140
Ward Leonard Elec. Co. ........................................................ 101
Waterman Products Co. ........................................................ 147
Workshop Associates .......................................................... 153
World Radio Laboratories .................................................... 141

46812

Nos. 46811-46812

GUILLOTINE TUNERS

JAMES MILLEN
MFG. CO., INC.
MAIN OFFICE AND FACTORY
MALDEN
MASSACHUSETTS

Designed for Application
ORIGINATORS OF NBFM EQUIPMENT FOR THE HAM

SONAR

DESIGNERS OF FINE COMMUNICATIONS EQUIPMENT

THE XE-10, first of the SONAR products, was designed to give the Ham a modulation unit for his complete AM rig. The XE-10 will convert any CW rig (regardless of power) to NBFM. Your VFO can be used to regulate the frequency input to the XE-10 or the xtal can be inserted directly into the XE-10.

THE VFX 680 was designed to meet the demands for a stable VFO-xtal exciter and also incorporates the exclusive SONAR NBFM circuit* giving a complete 4 to 6 watt all band exciter, with NBFM phone and/or straight CW. The VFX 680 also has VFX (vibrates any cut xtal) giving xtal stability with a variable signal. An ideal "pre-stage" for that new rig.

THE MB-611 is another SONAR product incorporating NBFM, designed for mobile or fixed operation, on 6 to 11 mtrs—40 watts input with a pin-network to match any antenna. Further details on this xmitter and other new SONAR developments will be found in future advertisements. The engineering staff at SONAR has many new designs including low, medium, and high power xmitters.

THE C.F.C. Sonar's new Calibrated Frequency Control has a Direct All Band, calibrated VFO; a finger-tip controlled 5" dial plainly marked for all bands 80, 40, 20, 15, 11, 10; a built-in 1000 kc frequency standard; calibrated against WWV; CW keying and built-in CW monitor with 5 watt output; provisions for remote control, the C.F.C. can be linked to any type xmitter. The C.F.C. is furnished complete with tubes, regulated power supply and a 1000 kc crystal.

SONAR

RADIO CORPORATION

General Offices & Factory: 59 MYRTLE AVE., B'KLYN 1, N.Y. . . . Sales Office: 600 S. MICH. AVE., CHI. 5, ILL.

$5975

$3945

$8745

$7245

$5975
The new Collins 310C-1 and 310C-2 exciters are designed around the highly stable, accurately calibrated 70E-8 permeability tuned oscillator. In operation, the slide rule dial indicates roughly your operating frequency, while the vernier dial gives you the frequency in kilocycles. You know where you are! You learn at once to use the exciter with perfect confidence.

The 310C-2 has a built-in power supply operating from a 115 volt, 50/60 cycle source. The power requirement for the 310C-1 is 6.3 volts a-c at 1.0 amp; 300 volts d-c at 40 ma. Otherwise these exciters are identical. Following the 70E-8 is a 6AG7 multiplier with an r-f output of approximately 80 volts rms across 40,000 ohms. This output is sufficient to furnish ample excitation to either the crystal stage or the 6L6 or 807 buffer stage of your present rig. The output frequency range is 3.2 to 4.0 mc. For the higher frequency bands, merely employ the multiplier stages which normally follow the crystal oscillator in your transmitter.

**Tube line-up**
- 1-6SJ7 Oscillator
- 1-6AG7 Multiplier
- 1-6X5 Rectifier (310C-2 only)
- 1-VR105 Regulator
- 1-VR150 Regulator

Net prices, complete with tubes and instruction book, F.O.B. Cedar Rapids, Iowa:

- 310C-1, without power supply... $85.00
- 310C-2, with power supply... 100.00

Terms: 20% with order. Balance, plus 5% carrying charge, payable in twelve equal monthly installments.
ON THE NEW
NATIONAL NC-183

1. Calibrated amateur bandspread for 6, 10-11, 20, 40 and 80 meter bands. Gear drive tuning dials.
2. Two RF stages on all bands! Image rejection 40 db at 28 mc!
3. New "double-diode" noise limiter, effective on both phone and CW!
4. New crystal filter provides 6 steps of selectivity!
5. S-meter with adjustable sensitivity for both phone and CW!
6. Temperature compensation and voltage regulator provide outstanding stability!
7. High-fidelity push-pull audio output!
8. Ideal for phonograph attachment. Tone control.

Accessory socket for NFM adaptor!

• RANGE: 0.54 to 31 mc. plus 48-56 mc.
• TUBE COMPLEMENT: 14 plus rectifier and voltage regulator.
• AUDIO OUTPUT: 8-watts undistorted

The brilliant new National NC-183 incorporates the latest in circuit design. Check its 8 outstanding performance features. Note the rugged, heavy-duty quality of the National-designed, National-built components at your dealer's today. When you see inside, you'll decide on the National NC-183.

$269 (with 10" speaker)

NFM-83 adaptor makes the NC-183 a top-notch NFM receiver. Instant selection of AM or NFM from front panel.

$16.95
In modulator service, uniformity counts...

...and you can count on RCA tubes to have it.

To make A equal B...to keep a-f distortion low and power output high, the plate currents of a push-pull modulator must be alike. In short, tubes must have dependable uniformity.

RCA power tubes have that uniformity, because they're built to exacting tolerances...and held there by modern production methods and thorough quality control.

Your local RCA tube distributor can supply you with modulator tubes...uniform tubes...for every transmitter power. For information, see him or write RCA, Commercial Engineering, Section AM.54, Harrison, N. J.

TYPICAL RCA HIGH-MU TUBES FOR MODULATOR SERVICE

<table>
<thead>
<tr>
<th>Tube</th>
<th>max. d-c plate volts</th>
<th>max. signal driving watts</th>
<th>output watts</th>
<th>Amateur net price per tube</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 RCA-807's</td>
<td>750</td>
<td>5.5</td>
<td>120</td>
<td>$2.30</td>
</tr>
<tr>
<td>2 RCA-810's</td>
<td>2750</td>
<td>13</td>
<td>725</td>
<td>12.50</td>
</tr>
<tr>
<td>2 RCA-811's</td>
<td>1500</td>
<td>3</td>
<td>220</td>
<td>3.50</td>
</tr>
</tbody>
</table>

Note: Values shown are for ICAS operation.

Get a copy of Oct.-Dec. HAM TIPS from your local RCA Tube Distributor for hot articles on a Speech Amplifier and a Modulator Bias Supply.

The Fountainhead of Modern Tube Development is RCA.